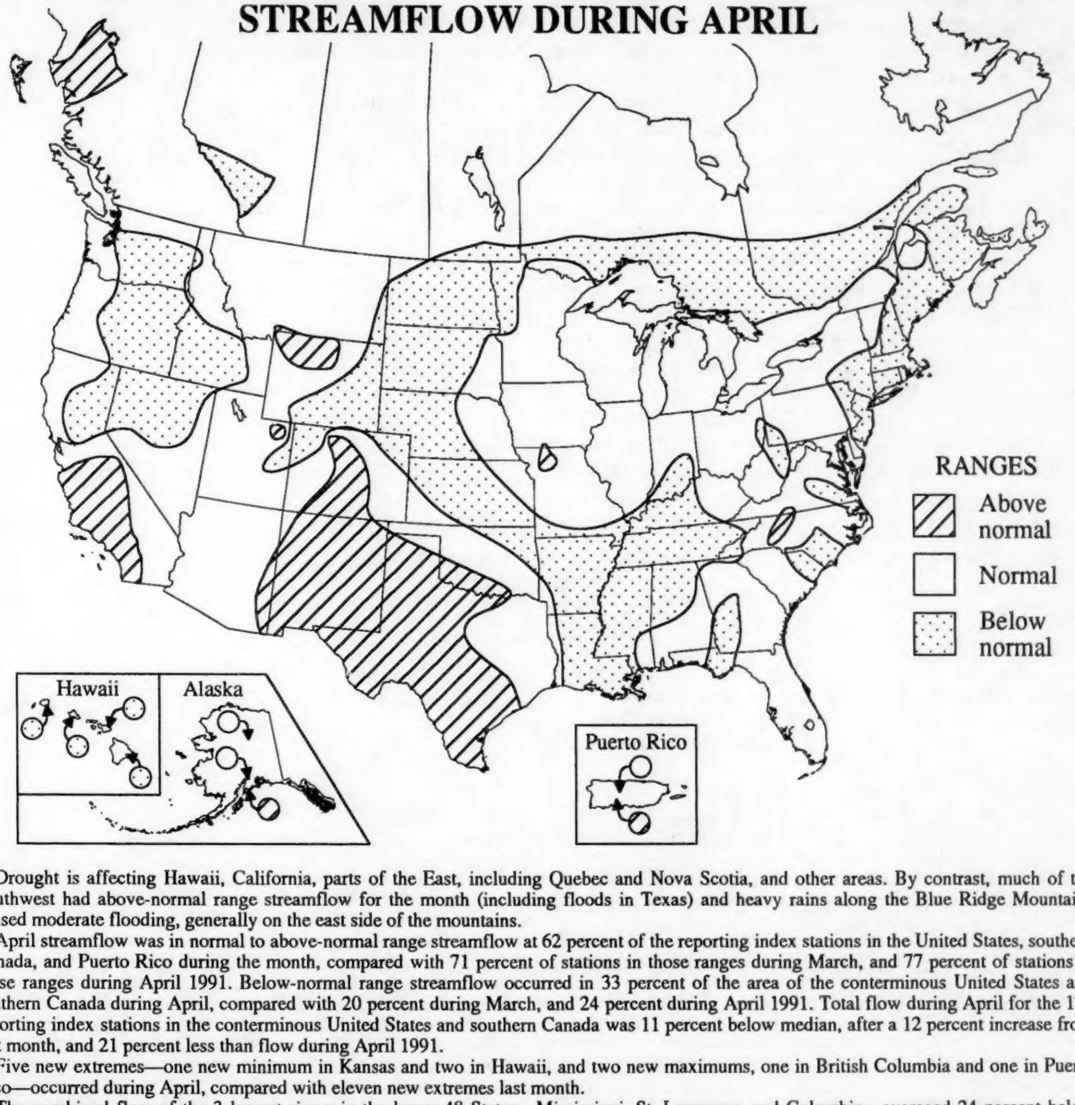
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

APRIL 1992

STREAMFLOW DURING APRIL



Drought is affecting Hawaii, California, parts of the East, including Quebec and Nova Scotia, and other areas. By contrast, much of the Southwest had above-normal range streamflow for the month (including floods in Texas) and heavy rains along the Blue Ridge Mountains caused moderate flooding, generally on the east side of the mountains.

April streamflow was in normal to above-normal range streamflow at 62 percent of the reporting index stations in the United States, southern Canada, and Puerto Rico during the month, compared with 71 percent of stations in those ranges during March, and 77 percent of stations in those ranges during April 1991. Below-normal range streamflow occurred in 33 percent of the area of the conterminous United States and southern Canada during April, compared with 20 percent during March, and 24 percent during April 1991. Total flow during April for the 174 reporting index stations in the conterminous United States and southern Canada was 11 percent below median, after a 12 percent increase from last month, and 21 percent less than flow during April 1991.

Five new extremes—one new minimum in Kansas and two in Hawaii, and two new maximums, one in British Columbia and one in Puerto Rico—occurred during April, compared with eleven new extremes last month.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 24 percent below median and in the below-normal range, after a 6 percent decrease in flow from March to April.

Month-end index reservoir contents were in the below-average range at 27 of 100 reporting sites, compared with 29 of 100 at the end of March, and 37 of 100 at the end of April 1991. Contents were in the above-average range at 38 reservoirs, compared with 39 last month, and 39 a year ago.

Mean April elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range but below median on all 4 lakes. Levels fell from those for March on Lake Superior, and rose from those for March on the other three lakes.

Utah's Great Salt Lake fell 0.20 foot, ending the month at 4,202.10 feet above National Geodetic Vertical Datum. Lake level was 0.70 foot lower than at the end of April 1991.

Streamflow decreased from that for March in the Florida and Gulf of Mexico, Upper Mississippi River, and the Southern Great Plains and Rio Grande basins, and increased in the other 9 basins. Streamflow was above median in 5 basins, and below median in the other 7 basins.

Ground-water levels were generally above last month's only in the Glaciated Central and Northeast and Superior Uplands regions and generally mixed or below long-term averages in all regions. New extremes occurred at 33 ground-water index stations during April,—29 lows (including 8 all-time) and 4 highs (including 1 all-time)— compared with 32 new extremes last month.

SURFACE-WATER CONDITIONS DURING APRIL 1992

Drought is still affecting several large areas. In Hawaii (see page 7) drought related to El Niño is occurring. In California, total streamflow, reservoir contents, and ground-water levels remained well-below average. Total flow for April at the six index stations in California was 41 percent below median after a 33 percent decrease from that for March. The persistence and severity of the drought in California is shown by the following: (1) since the end of August 1990 (the most recent month of above-median streamflow), the cumulative streamflow deficit at the six index stations has gone from about 73 percent of a median year of runoff to about 145 percent of a median year of runoff—about 72 percent of a median year of runoff was "lost" in the last 19 months; (2) the seasonal lows in combined storage for 6 large index reservoirs have generally declined steadily since 1986, bottoming out at 69, 53, 43, 45, 33, and 31 percent of capacity. The current month's storage in these 6 large reservoirs rose by about 6 percent of total capacity from that for March and is now at 53 percent of normal maximum, higher than at any time last year. More data on California hydrologic conditions are given on pages 7-9. In the East, the contents of the New York City Reservoir System were 16 percent below the long-term average for the end of April, despite increasing from 70 percent of capacity at the end of March to 84 percent of capacity at the end of April, and about 15 percent less than contents at the end of April 1991. Reservoir storage in Quebec and Nova Scotia is also well below long-term averages.

By contrast, much of the Southwest, including parts of California, Arizona, New Mexico, and Texas (where moderate to severe, but less-than record flooding occurred) had above-normal range streamflow for the month. Heavy rains along the Blue Ridge Mountains caused moderate flooding in some areas, mostly on the east side of the mountains, but much of the Southeast remained dry.

April streamflow decreased from that for March at 91 index stations, remained unchanged at 1 index station, and increased at 101 index stations, resulting in normal to above-normal range streamflow at 62 percent of the 192 reporting index stations in the United States, southern Canada, and Puerto Rico during the month, compared with 71 percent of stations in those ranges during March, and 77 percent of stations in those ranges during April 1991. Below-normal range streamflow occurred in 33 percent of the area of the conterminous United States and southern Canada during April, compared with 20 percent during March, and 24 percent (revised) during April 1991. Total flow of 943,400 cubic feet per second (ft^3/s) during April for the 174 reporting index stations in the conterminous United States and southern Canada was 11 percent below median, after a 12 percent increase from last month, and 21 percent less than flow during April 1991.

Five new extremes—one new minimum in Kansas and two in Hawaii, and two new maximums, one in British Columbia and one in Puerto Rico—occurred during April (see table on page 4), compared with six new minimums and five new maximums during March. Hydrographs for the stations at which new extremes occurred are on page 5. Also on page 5 are the hydrographs for the

(Continued on page 4)

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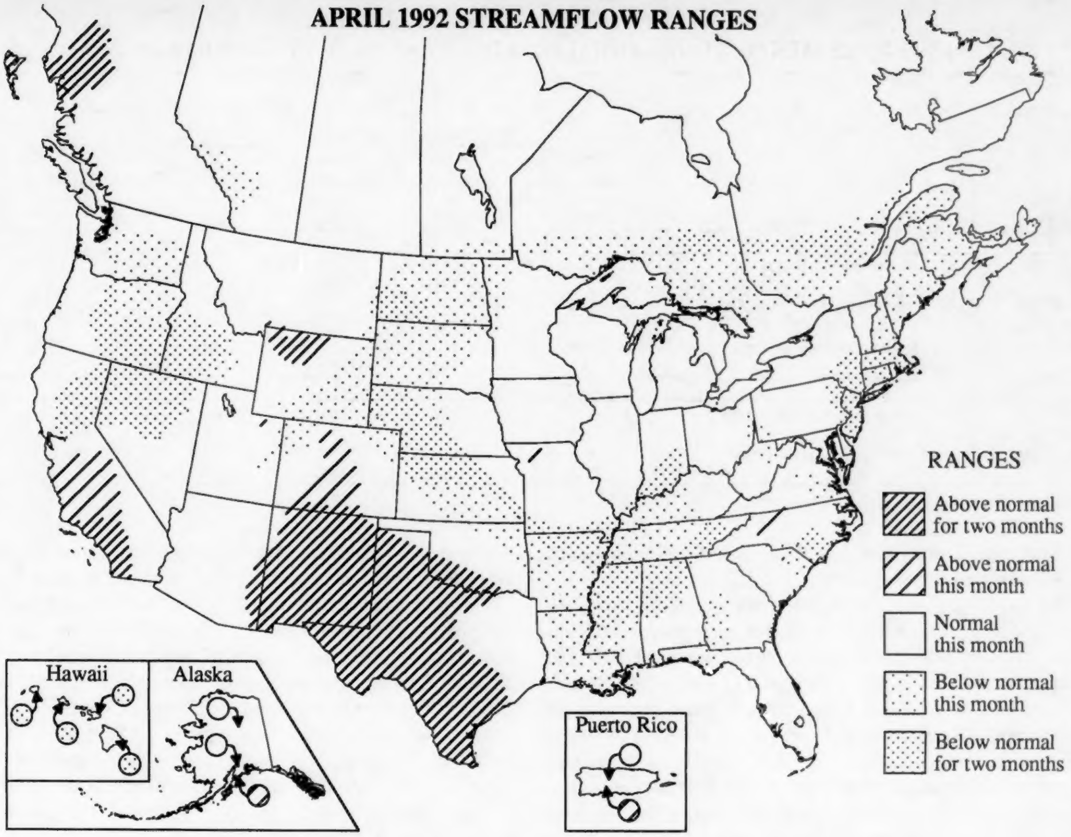
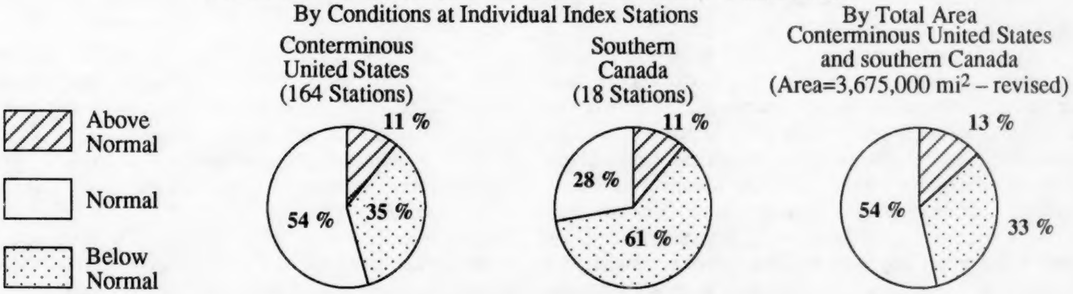
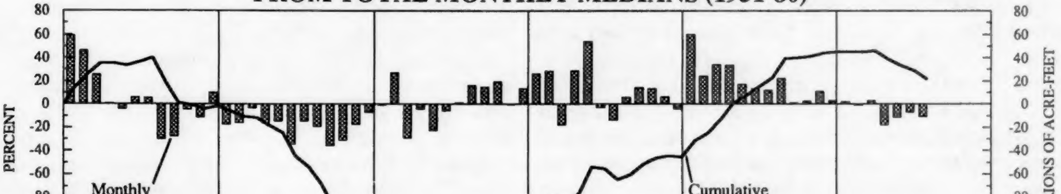
APRIL 1992 STREAMFLOW RANGES



SUMMARY OF APRIL 1992 STREAMFLOW RANGES



MONTHLY AND CUMULATIVE DEPARTURE OF TOTAL MONTHLY MEANS FROM TOTAL MONTHLY MEDIANS (1951-80)



NEW EXTREMES DURING APRIL 1992 AT STREAMFLOW INDEX STATION

				Previous April extremes (period of record)		April 1992			
Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Monthly mean in cfs (year)	Daily mean in cfs (year)	Monthly mean in cfs	Percent of median	Daily mean in cfs	Day
				LOW FLOWS					
06867000	Saline River near Russell, Kansas	1,502	40	6.00 (1991)	4.38 (1991)	2.70	6	2.60	31
16587000	Honopou Stream near Huelo, Maui, Hawaii	.64	80	.84 (1953)	.38 (1983)	.57	10	.35	*
16700000	Waiakea Stream near Mountain View, Hawaii, Hawaii	17.4	61	.66 (1931)	.00 (1931)	.11	1	.02	27
				HIGH FLOWS					
08960100	Skeene River at USK, British Columbia	16,293	58	28,530 (1941)	92,865 (1977)	39,194	334	61,086	28
50112500	Rio Inabon at Real Abaio, Puerto Rico	9.7	25	16.2 (1978)	126 (1983)	19.19	376	87.0	20

*Occurred more than once.

Susquehanna River at Harrisburg, Pennsylvania, and the Willamette River (adjusted) at Salem, Oregon.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,076,000 ft^3/s, 24 percent below median and in the below-normal range, after a 6 percent decrease in flow from March to April. Flow of the St. Lawrence River was in the normal range for the 11th consecutive month. Flow of the Mississippi River was in the below-normal range after a normal range March. Flow of the Columbia River was in the normal range for the third consecutive month after five consecutive months in the below-normal range. Hydrographs for both the combined and individual flows of the "Big 3" are on page 10. Dissolved solids and water temperatures at four large river stations are also given on page 10. Flow data for the "Big 3" and 42 other large rivers are given in the Flow of Large Rivers table on page 11.

Month-end index reservoir contents were in the below-average range (below the month-end average for the period of record by more than 5 percent of normal maximum contents) at 27 of 100 reporting sites, compared with 29 of 100 at the end of March, and 37 of 100 at the end of April 1991, including most reservoirs in Quebec, Nova Scotia, Maryland, Nebraska, the Dakotas, Idaho, Utah, Nevada, California and the Colorado River Storage Project. Contents were in the above-average range at 38 reservoirs (compared with 39 last month, and 39 a year ago), including most reservoirs in Maine, New Hampshire, Massachusetts, New York, the Carolinas, the Tennessee Valley, Wisconsin, Texas, New Mexico, Arizona, and Washington. Reservoirs with contents in the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet) are: Gouin, Quebec; the New York City Reservoir System, New York; Boise River, Idaho; and Lake Berryessa, California. Only one reservoir had less than 10 percent of normal maximum contents: Lake Tahoe, California-Nevada, which had no usable storage for the 19th consecutive month. Graphs of contents for seven reservoirs are shown on page 12 with contents for the 100 reporting reservoirs given on page 13. Reservoir storage conditions near the end of April 1992 and April 1991 are shown on streamflow maps on page 15.

Mean April elevations at four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range and below median on all four lakes. Levels fell from those for March on Lake Superior, and rose from those for March on the other three lakes. April levels ranged from 0.13 foot lower (Lake Superior) to 0.92 foot higher (Lake Ontario) than those for March. Monthly means have now been in the normal range for 7 months on Lake Superior, 23 months on Lake Huron, 13 months on Lake Erie, and 2 months on Lake Ontario. April 1992 levels ranged from 1.33 feet lower (Lake Ontario) to 0.01 foot higher (Lake Superior) than those for April 1991. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 14.

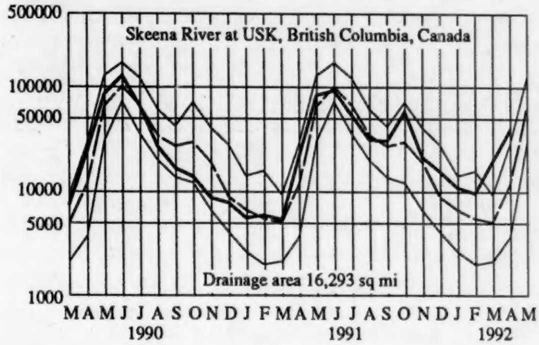
Utah's Great Salt Lake (graph on page 14) fell 0.20 foot, ending the month at 4,202.10 feet above National Geodetic Vertical Datum. Lake level was 0.70 foot lower than at the end of April 1991, and 9.75 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

Maps on page 15 show streamflow conditions for April 1992 and April 1991. April 1992 has about 32 percent less area in the above-normal range, about 38 percent more area in the below-normal range, and about 5 percent less area in the normal range than April 1991. Below-normal range streamflow occurred during both months in parts of Hawaii, California, Oregon, Nevada, Utah, Idaho, Montana, Wyoming, Colorado, Kansas, Nebraska, the Dakotas, Saskatchewan, Manitoba, Ontario, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Alabama. Above-normal range streamflow occurred during both months in parts of British Columbia, Arizona, New Mexico, Colorado, and North Carolina. Both maps also show reservoir storage near the end of the month at all reporting index reservoir stations for comparison with streamflow.

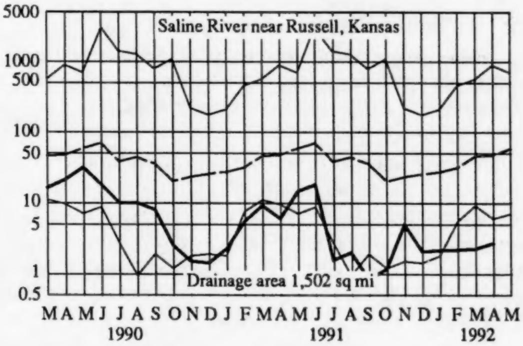
Graphs for 12 hydrologic areas show monthly percent departure of streamflow from median for the 1987-92 water years (page 16) and also compare monthly streamflow for the 1991 and 1992 water years with median monthly streamflow for 1951-80 (page 17). Streamflow decreased from that for March in the Florida and Gulf of Mexico, Upper Mississippi River, and the Southern Great Plains and Rio Grande basins, and increased in the other 9 basins. Streamflow was above median in the Upper Mississippi River, Missouri River, Southern Great Plains and Rio Grande, Colorado River, and Pacific Slope basins, and below median in the other 7 basins.

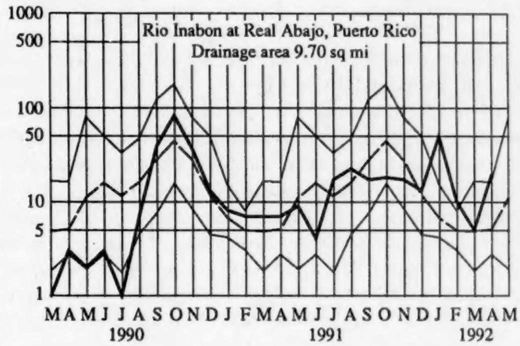
MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

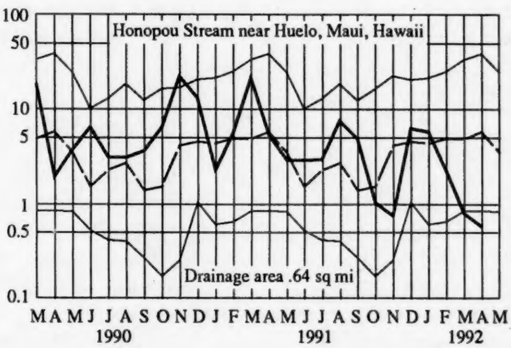
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.

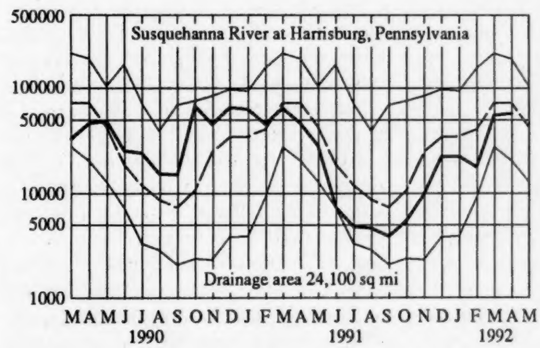


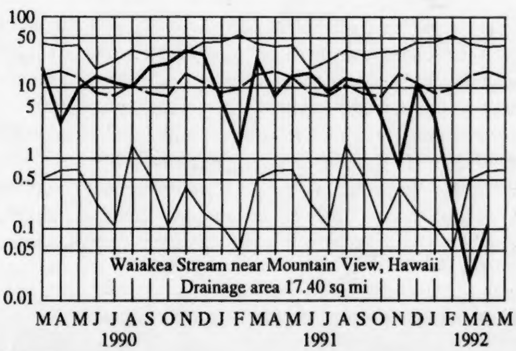
DISCHARGE IN CUBIC FEET PER SECOND

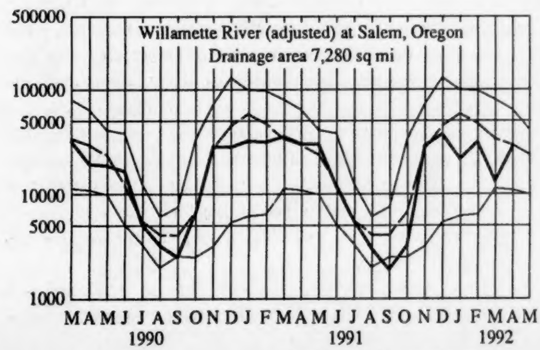












APRIL WEATHER SUMMARY

(From *Weekly Weather and Crop Bulletin*, USDA/NOAA Joint Agricultural Weather Facility)

The month of April commenced with wintry conditions in the East while abnormally warm weather covered the Pacific Northwest and northern Rockies. A blast of Arctic air produced more than a dozen record lows from the Deep South to the mid-Atlantic as freezing temperatures engulfed the Deep South and south Atlantic. Wintry conditions also prevailed from the extreme northern Plains eastward to New England. More than six inches of snow blanketed parts of the upper Midwest and Great Lakes and eventually spread into western New England. In sharp contrast, highs soared above 80 °F as far north as Oregon and South Dakota, and several daily record highs were established. Strong thunderstorms generated heavy rain, hail, damaging winds, and numerous tornadoes across the southern Plains, Midwest, and Southeast. Farther west, up to six inches of rain drenched parts of Oregon and northern California while blizzard conditions buffeted portions of Alaska's Arctic Coast.

During the middle of the month, Arctic air settled across the northern tier of states from the Dakotas eastward. Nearly a dozen daily record lows were observed from the northern Plains to the Ohio Valley, with readings plummeting below zero in the upper peninsula of Michigan. A wintry mixture of precipitation fell across the upper Midwest, making driving hazardous on portions of I-90 in Minnesota. Along the boundary between the Arctic air and more spring-like weather farther south, severe thunderstorms, packing heavy rain, large hail, and damaging winds, tore through portions of the Great Plains and Ohio Valley. More than a dozen tornadoes touched down in the Plains and Midwest while over eight inches of rain inundated parts of southeastern Texas and central Oklahoma, causing flash floods. Unseasonably warm weather dominated from the central High Plains eastward to the central Appalachians. At least two dozen daily record highs were established from Wyoming to West Virginia as readings soared above 80 °F. Farther west, heavy snow buried the Colorado Rockies, with up to ten inches falling at Vail. Bitterly cold conditions gripped interior sections of Alaska early in the week. The mercury sank to -23 °F at Fairbanks, AK, setting a record for the lowest reading so late in the season.

A major spring storm brought wintry conditions to a large portion of the nation's midsection and severe weather across much of the eastern half of the U.S. during the third week of April. More than a foot of snow buried the Black Hills and lower Missouri Valley. Wind gusts of up to 60 mph accompanied the storm, producing blizzard-like conditions in the Black Hills and drifts over three feet in eastern Nebraska. International Falls, MN received enough snow to push their seasonal total to a record 105.7 inches. The system funneled cold air out of Canada in its wake, yielding record daily lows in the central Plains as readings dipped into the twenties. Snow associated with this system continued over the upper Midwest, where a few inches fell from northeastern Minnesota into northwestern Wisconsin. Ahead of the system, severe weather exploded from the Deep South northeastward into the Ohio Valley as strong thunderstorms unleashed heavy rains, hail, and several tornadoes. Heavy rain again drenched southern Texas, where some locations have received almost twice their normal precipitation since the beginning of the year. Nearly eight inches of rain inundated southwestern Virginia while nearly half a foot soaked western North Carolina. Flooding and a weakened earthen dam forced the evacuation of nearly 300 people in the mountains of North Carolina. Elsewhere, dense fog contributed to two multi-vehicle accidents involving up to 60 cars and trucks on I-64 in the Virginia Blue Ridge Mountains. Farther west, cold weather replaced the persistent warmth in the Pacific Northwest, setting several record daily lows as readings dropped into the twenties.

The last week of April began with daily record highs baking central and southern sections of the western United States and High Plains while a large high pressure system over the mid-Mississippi Valley pulled unseasonably cool air southward into the East. The boundary between the contrasting air masses again served as a focal point for severe weather, which brought a barrage of torrential rain, large hail, high winds, and tornadoes to the southeastern Plains and lower Mississippi Valley as the month drew to a close.

Heavy rain inundated the West Coast with monthly totals approaching 14 inches at some higher elevations. Torrential downpours also soaked the Gulf Coasts of Texas and western Louisiana with up to a foot of rain during April while the central Appalachians, parts of Florida and adjacent Georgia, much of central Oklahoma, and portions of Iowa, Minnesota, Wisconsin, and Michigan recorded over four inches.

In sharp contrast, precipitation amounts were less than half of normal from the northern and central Plains westward to parts of Nevada and California. Abnormally dry weather was widespread across the central Mississippi and lower Ohio Valleys, through much of the Deep South, and along the Atlantic Coast from North Carolina to Maine. Hawaii and most of Alaska also reported drier than normal conditions.

Temperatures averaged 4 °F to 10 °F above normal over much of the western half of the country, causing many areas to record average temperatures among the warmest ten percent of the 1951-1980 April climatological distribution. The High Plains also reported departures of +3 °F to +7 °F while lesser positive departures were reported in the northern Rockies. In Alaska, readings averaged 2 °F to 4 °F above normal across the Panhandle and along most of the northern, western, and southern coasts.

Unseasonably cool weather generated departures of -2 °F to -5 °F across much of the Southeast. Temperatures averaged as much as 3 °F below normal in the upper Great Lakes, upstate New York, and New England as a result of repeated surges of Arctic air. Some sections of the middle Missouri Valley and southern Texas also experienced subnormal temperatures. In eastern Alaska, departures dipped as low as -4 °F. Near normal temperatures dominated Hawaii. Since the beginning of the year, most of the country has been quite warm, with only scattered southeastern and northeastern states experiencing submedian January - April temperatures.

EL NINO AND HAWAIIAN DROUGHT

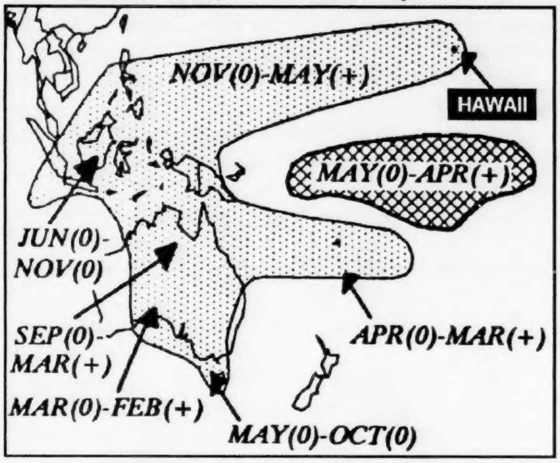
(From Weekly Weather and Crop Bulletin, NOAA/USDA Joint Agricultural Weather Facility)

Atmospheric changes associated with the present El Niño event have contributed to unusual dryness in Hawaii. Statistical studies have shown that, during an El Niño event, Hawaii is prone to drier-than-normal conditions between November of the onset year (for example, 1991) and May of the following year (for example 1992). Hawaii lies at the northeasternmost fringe (map below) of an expansive zone that is typically affected by abnormal dryness during all, or part, of an El Niño event.

Potential Hawaiian Rainfall Impacts from El Niño

(based on statistical correlations)

Prepared by the Joint Agricultural Weather Facility. Source: Ropelwald and Halpert, 1987. Monthly Weather Review, (115) p. 1606-1626.



WET DRY

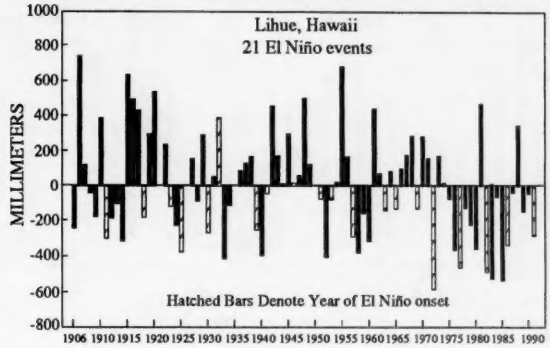
(0) = Year of El Niño onset (that is, 1991)

(+) = Year following onset (that is, 1992)

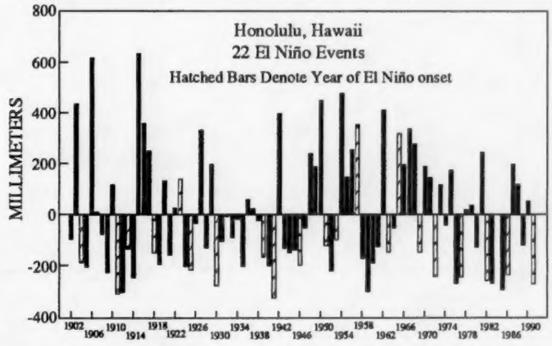
Since November 1, 1991, most Hawaiian locations have received less than half of the normal rainfall: Lihue, Kauai, 68 percent; Honolulu, Oahu, 30 percent; Kahului, Maui, 41 percent; and Hilo, Hawaii, 45 percent. Normals for the 6-month period vary greatly across the State. For example, Honolulu, on southern Oahu, typically receives about 500 mm (just under 20 inches), whereas Hilo, on the northeastern (windward) side of Hawaii Island, normally garners almost 2,000 mm (more than 75 inches). The current drought has adversely affected agriculture, forcing Hawaii and Maui Islands into irrigation water restrictions, and altering or restricting planting schedules. Many rain-fed pastures and grazing areas are critically dry, according to the State's agricultural summaries.

Historical November to April rainfall data show an excellent correlation between El Niño events and Hawaiian drought. In Lihue, 20 of the past 21 El Niño events dating to 1905, have been accompanied by normal to below-normal rainfall. On 10 of those occasions (see first graph below), rainfall has been more than 200 mm below normal. Data for Hilo (not shown) and Honolulu (see second graph below) are similar, although El Niño events in 1957-58 and 1965-66 were marked by very wet conditions in Honolulu.

DEPARTURE FROM NORMAL RAINFALL, NOVEMBER-APRIL



DEPARTURE FROM NORMAL RAINFALL, NOVEMBER-APRIL



CALIFORNIA WATER CONDITIONS

(From *California Water Supply Outlook*, California Department of Water Resources)

Drought Extends Into Sixth Year

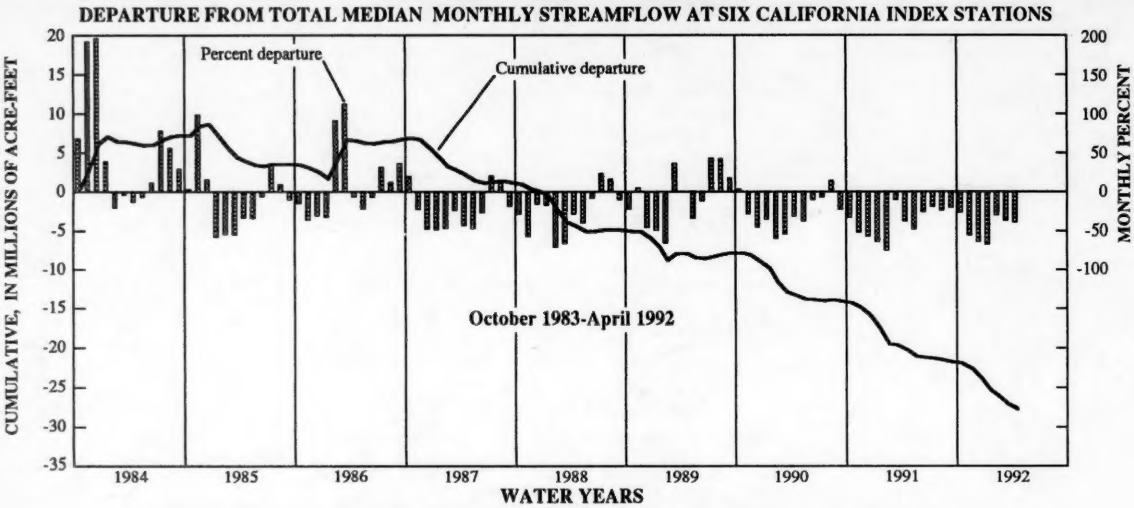
In keeping with the pattern of many El Niño years, April precipitation was well below average in California. The exceptions were a swath across the northern tier of counties which had been extremely dry so far and the southeastern desert where some early April showers boosted average area precipitation over the very low monthly average of only 0.2 inche. Statewide precipitation in April was about 65 percent of normal. Seasonal precipitation since October 1 is about 85 percent of average, but amounts in major Sierra watersheds are generally close to 70 percent.

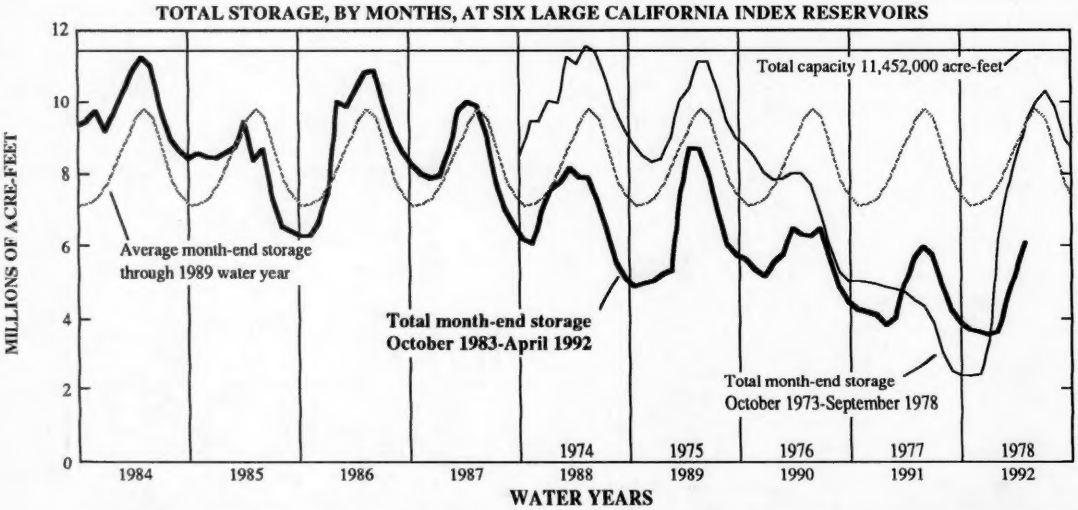
This is the 6th consecutive year of much below average runoff. Water year runoff in 1992 is forecast to be about half average, not much different than last year. Coast Range runoff is better this year south of San Jose which has eased drought problems temporarily for those dependent on local streams. Central Valley basin water year runoff forecasts range from slightly more than 1991 in the north to somewhat less in the south, particularly the southern Sierra. As of this writing, State Water Project deliveries will be 45 percent of requests and Central Valley Project deliveries will range from 25 to 75 percent, depending on the type of contract. The SWP amounts compare to 30 percent last year to urban users and none to agricultural contractors; the CVP deliveries are quite similar to last year.

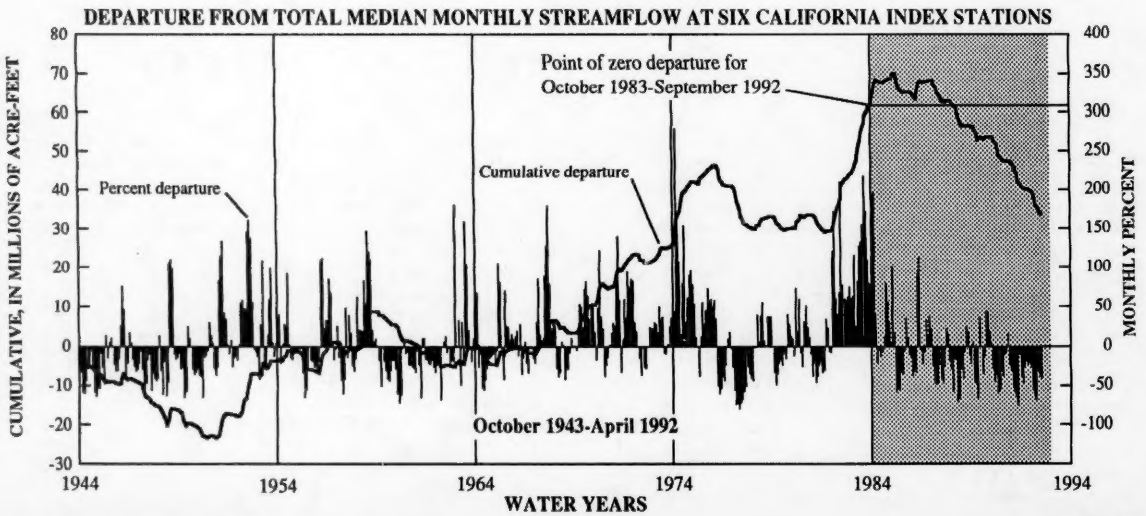
Total in-state reservoir storage on the first of May was 20.2 million acre-feet (maf), 72 percent of average. This is about 2 maf more than last year. However, because of the warm spring much of the snowpack has already melted with mountain stream runoff expected to recede rapidly compared to last year. May 1 snowpack water content this year was only 25 percent of average, whereas, the pack last year, with cooler weather, was 65 percent of average. This means that the current reservoir storage advantage is likely to fade during the next two months and late summer levels overall probably will be similar to those of last year.

The driest six year period in Sacramento basin history is still 1929-34, with average unimpaired runoff of about 9.8 MAF per year or 53 percent of average. The 1987-92 average, based on the May 1 forecast, will be about 10 MAF. For Central California, including the central and southern Sierra, the current 6 year period is the driest such period in history by a wide margin.

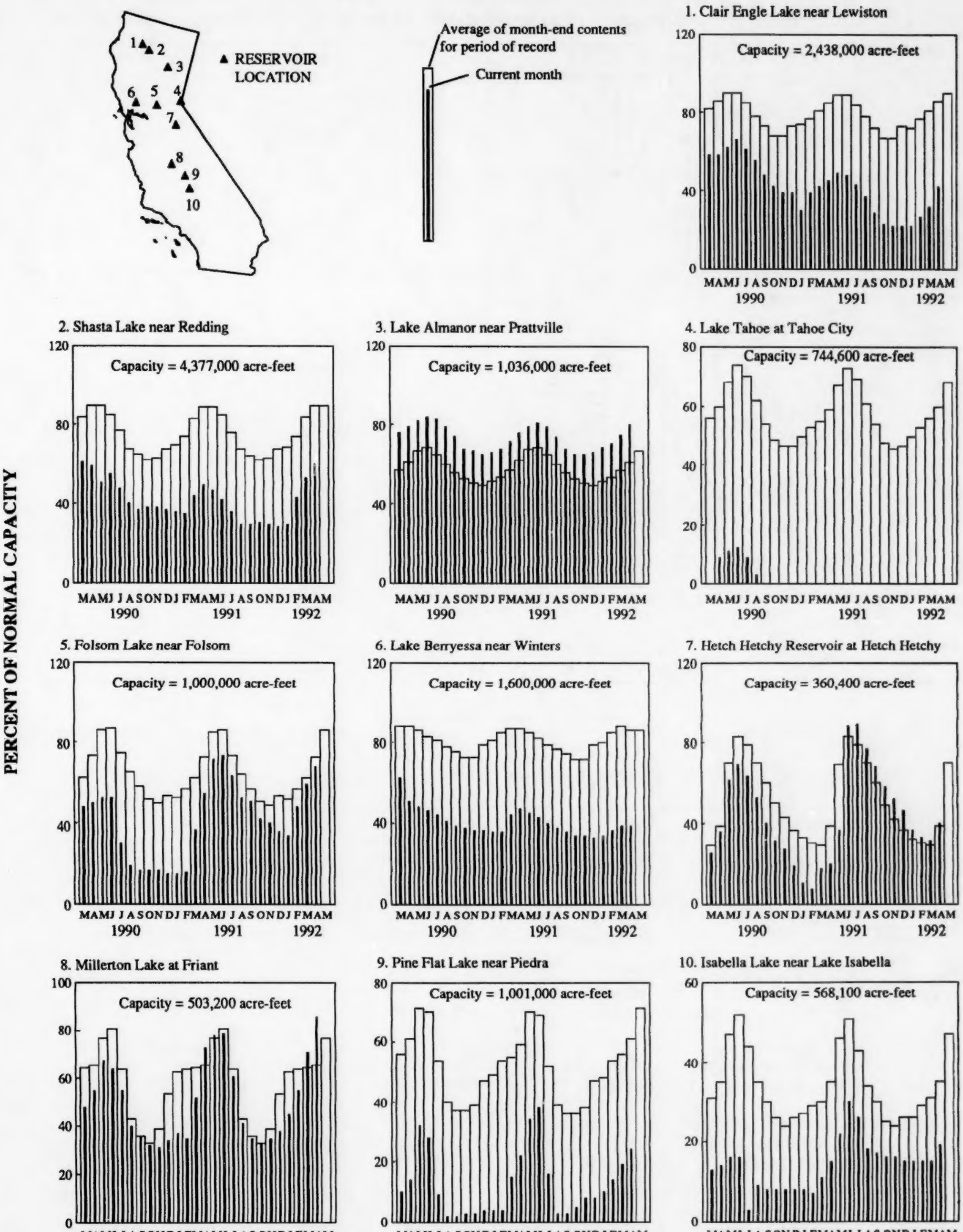
CALIFORNIA STREAMFLOW (1984-92), RESERVOIR CONTENTS, AND STREAMFLOW (1944-92)





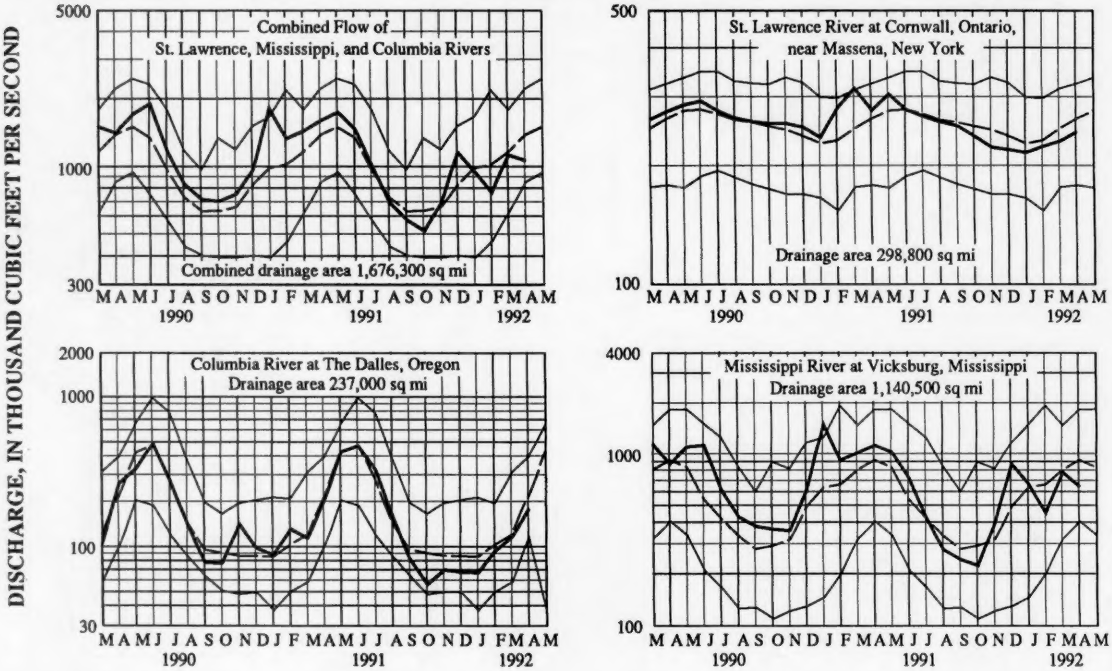


CALIFORNIA RESERVOIR INDEX STATIONS



HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR APRIL 1992, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

Station number	Station name	April data of following calendar years	Stream discharge during month: Mean (cfs)	Dissolved-solids concentration[1]: Minimum (mg/L)	Dissolved-solids concentration[1]: Maximum (mg/L)	Dissolved-solids discharge[1]: Mean (tons per day)	Dissolved-solids discharge[1]: Minimum (tons per day)	Dissolved-solids discharge[1]: Maximum (tons per day)	Water temperature[2]: Mean in °C	Water temperature[2]: Minimum in °C	Water temperature[2]: Maximum in °C
01463500	Delaware River at Trenton,	1992	13,830	74.5	97.8	3,190	2,370	4,585	10.5	6.5	14.5
	New Jersey, (Morrisville,	1945-91	21,380	46	124	[3]3,991	1,200	21,500	[3]11.0	3.0	22.5
	Pennsylvania)	(Extreme yr)		(1962)	(1981)		(1985)	(1983)			
			[4]22,320								
07289000	Mississippi River at	1992	652,300	199	261	406,200	312,000	497,000	19.5	10.0	14.0
	Vicksburg, Mississippi	1976-91	991,500	150	288	511,500	180,000	1,030,000	13.5	7.0	22.5
		(Extreme yr)		(1985)	(1986)		(1981)	(1979)			
			[4]930,400								
03612500	Ohio River at lock and dam 53,	1992	255,800	199	235	...	77,900	240,000	...	10.5	14.5
	near Grand Chain, Illinois,	1955-91	426,600	117	282	...	22,400	462,000	...	5.0	19.0
	(streamflow station at Metropolis,	(Extreme yr)		(1957)	(1969)		(1976)	(1975)			
	Illinois)		[4]480,500								
06934500	Missouri River at Hermann,	1992	102,000	245	437	83,300	54,100	131,400	16.5	10.0	22.0
	Missouri. (60 miles west of	1976-91	122,275	157	504	109,070	41,400	270,000	14.0	6.0	22.5
	St. Louis, Missouri)	(Extreme yr)		(1979)	(1981)		(1977)	(1984)			
			[4]88,120								
14128910	Columbia River at Warrendale,	1992	143,000	92	106	38,800	23,500	52,500	11.0	10.0	12.0
	Oregon (streamflow station at	1976-91	199,600	85	128	56,400	22,300	96,100	9.0	6.5	12.5
	The Dalles, Oregon)	(Extreme yr)		(1976)	(1985, 1989)		(1977)	(1984)			
			[4]220,700								

[1]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[2]To convert °C to °F: [(1.8 x °C) + 32] = °F.
[3]Mean for 8-year period (1983-91).
[4]Median of monthly values for 30-year reference period, water years 1951-80, for comparison with data for current month.

Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING APRIL 1992

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1985 (cubic feet per second)	April 1992					
				Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge 1951–80	Change in discharge from previous month (percent)	Discharge near end of month		
							Cubic feet per second	Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,665	9,758	28,170	134	621	46,400	30,000	30
01318500	Hudson River at Hadley, New York	1,664	2,908	7,700	86	96	7,500	4,850	30
01357500	Mohawk River at Cohoes, New York	3,456	5,683	† 10,200	71	53	7,000	4,500	30
01463500	Delaware River at Trenton, New Jersey	6,780	11,670	† 13,830	59	4	13,400	8,660	30
01570500	Susquehanna River at Harrisburg, Pennsylvania	24,100	34,340	57,100	79	5	65,400	42,300	26
01646500	Potomac River near Washington, District of Columbia	11,560	[1]11,500	[1]18,900	101	–4	...	...	...
02105500	Cape Fear River at William O. Huske Lock, near Tarheel, North Carolina.	4,852	5,002	† 4,831	78	–13	...	...	...
02131000	Pee Dee River at Peedee, South Carolina	8,830	9,871	11,800	88	–16	35,400	22,900	30
02226000	Altamaha River at Doctortown, Georgia	13,600	13,730	17,010	71	–44	12,000	7,800	30
02320500	Suwannee River at Branford, Florida	7,880	6,986	10,090	100	–24	8,060	5,210	30
02358000	Apalachicola River at Chattahoochee, Florida	17,200	22,420	† 23,870	72	–34	21,500	13,900	30
02467000	Tombigbee River at Demopolis lock and dam, near Coatopa, Alabama.	15,385	23,520	† 16,470	34	–43	6,600	4,270	30
02489500	Pearl River near Bogalusa, Louisiana	6,573	9,880	† 6,760	39	–53	5,170	3,340	30
03049500	Allegheny River at Natrona, Pennsylvania	11,410	[1]19,580	[1]35,230	97	32	39,700	25,700	27
03085000	Monongahela River at Braddock, Pennsylvania	7,337	[1]12,480	† [1]13,360	69	–43	12,500	8,080	27
03193000	Kanawha River at Kanawha Falls, West Virginia	8,367	12,550	19,920	119	–13	18,200	11,800	29
03234500	Scioto River at Higby, Ohio	5,131	4,583	5,442	73	11	4,330	2,800	30
03294500	Ohio River at Louisville, Kentucky[2][#]	91,170	115,800	175,800	84	–22	174,000	112,000	29
03377500	Wabash River at Mount Carmel, Illinois	28,635	27,660	41,410	82	117	45,900	29,700	30
03469000	French Broad River below Douglas Dam, Tennessee[3][#].	4,543	[1]6,739	† [1]7,548	67	–23	...	...	...
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wisconsin.[2]	6,010	4,238	6,675	96	14	10,300	6,640	30
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, New York.[4][#]	298,800	243,900	245,000	92	6	250,000	162,000	30
02NG001	St. Maurice River at Grand Mere, Quebec	16,300	24,910	† 24,400	55	155	67,700	43,800	25
05082500	Red River of the North at Grand Forks, North Dakota	30,100	2,593	† 2,698	30	–37	3,690	2,380	30
05133500	Rainy River at Manitou Rapids, Minnesota	19,400	12,920	16,000	95	70	23,000	14,900	30
05330000	Minnesota River near Jordan, Minnesota	16,200	3,680	10,240	145	–48	16,500	10,700	30
05331000	Mississippi River at St. Paul, Minnesota[#]	36,800	[1]11,020	23,890	97	–31	36,800	23,800	30
05365500	Chippewa River at Chippewa Falls, Wisconsin	5,650	5,149	12,700	123	39	9,600	6,200	30
05407000	Wisconsin River at Muscoda, Wisconsin	10,400	8,710	18,100	115	59	13,700	8,850	30
05446500	Rock River near Joslin, Illinois	9,549	6,080	9,180	91	3	10,200	6,590	30
05474500	Mississippi River at Keokuk, Iowa[#]	119,000	63,790	126,900	98	1	183,000	118,000	30
06214500	Yellowstone River at Billings, Montana	11,795	7,056	4,780	120	114	10,400	6,720	30
06934500	Missouri River at Hermann, Missouri[#]	524,200	80,880	102,000	116	64	114,000	73,700	30
07289000	Mississippi River at Vicksburg, Mississippi[5][#]	1,140,500	584,000	† 652,300	70	–17	646,000	418,000	27
07331000	Washita River near Dickson, Oklahoma	7,202	1,402	* 2,577	275	–12	1,870	1,210	28
08276500	Rio Grande below Taos Junction Bridge, near Taos, New Mexico.	9,730	742	* 1,740	336	86	1,790	1,160	30
09315000	Green River at Green River, Utah	44,850	6,391	† 3,775	71	8	...	...	...
11425500	Sacramento River at Verona, California	21,251	19,430	† 9,205	47	–54	...	...	...
13269000	Snake River at Weiser, Idaho	69,200	18,520	† 8,770	40	–19	8,050	5,200	30
13317000	Salmon River at White Bird, Idaho	13,550	11,390	11,100	108	99	20,300	13,100	30
13342500	Clearwater River at Spalding, Idaho	9,570	15,510	21,700	75	58	38,000	24,600	30
14105700	Columbia River at The Dalles, Oregon[6][#]	237,000	[1]193,500	[1]179,200	81	51	185,000	120,000	30
14191000	Willamette River at Salem, Oregon	7,280	[1]23,690	[1]27,640	95	113	12,600	8,140	30
15515500	Tanana River at Nenana, Alaska	25,600	23,810	7,457	93	4	8,400	5,430	30
08MF005	Fraser River at Hope, British Columbia	83,800	96,250	* 104,500	174	66	175,000	113,000	30

[#]Indicates stations excluded from the combination bar/line graph. See Explanation of Data.

[1]Adjusted.

[2]Records furnished by Corps of Engineers.

[3]Records furnished by Tennessee Valley Authority.

[4]Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.

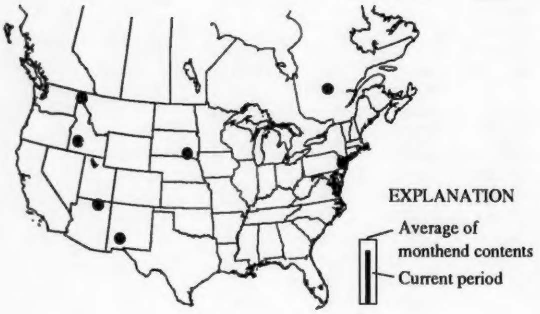
[5]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.

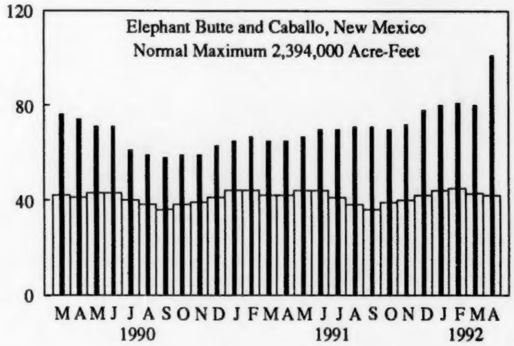
[6]Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

* Above–normal range

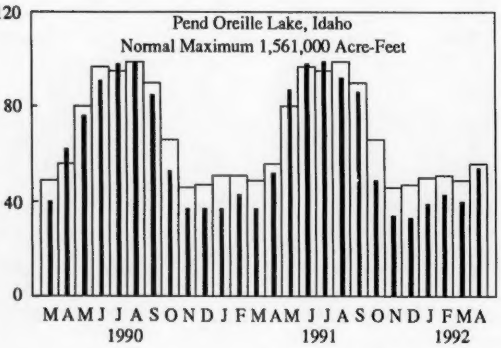
† Below–normal range

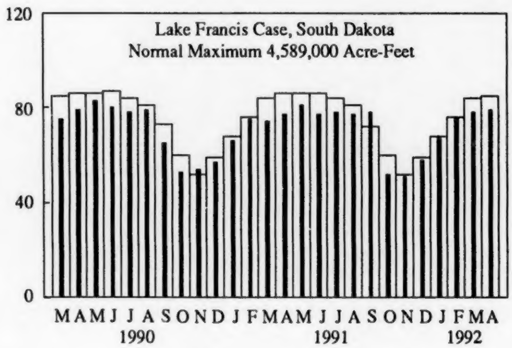
USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS

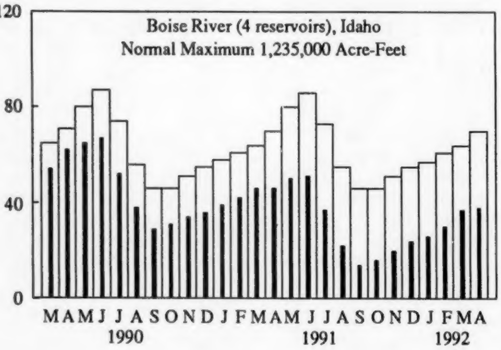


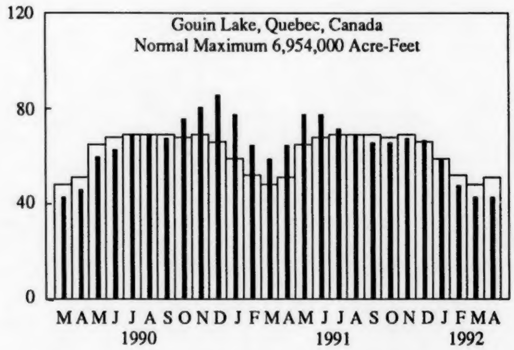


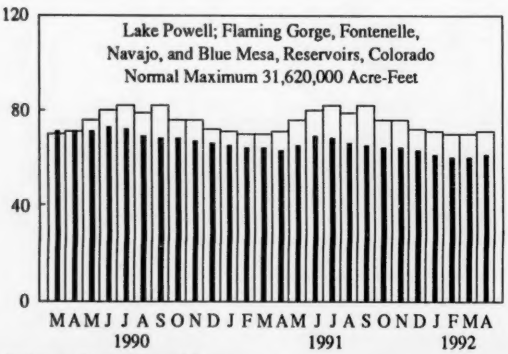
PERCENT OF NORMAL MAXIMUM

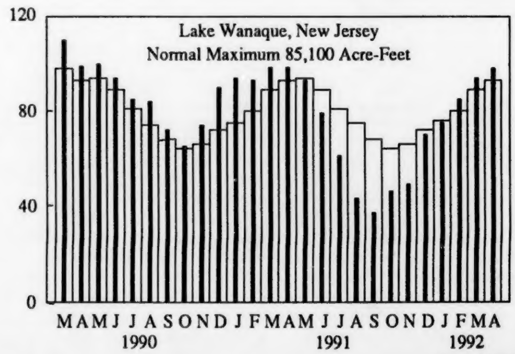












Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS NEAR END OF APRIL 1992

[Contents are expressed in percent of reservoir or reservoir system capacity. The usable capacity of reservoir or reservoir system is shown in the column headed "Normal maximum"]

Reservoir or reservoir system Principal uses: F-Flood control I-Irrigation M-Municipal P-Power R-Recreation W-Industrial	Percent of normal maximum: End of April 1992	End of April 1991	Average for end of April	End of March 1992	Normal maximum (acre-feet)[1]
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	†61	83	77	55	[2]226,300
QUEBEC					
Allard (P)	†62	85	80	16	280,600
Gouin (P)	†43	65	51	43	6,954,000
MAINE					
Seven Reservoir Systems (MP)	*79	93	70	46	4,107,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	*63	82	52	34	76,450
Lake Francis (FPR)	*82	89	57	51	99,310
Lake Winnipesaukee (PR)	†86	88	96	64	165,700
VERMONT					
Harriman (P)	76	69	78	50	116,200
Somerset (P)	78	85	75	61	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	*96	93	88	89	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	*100	95	90	59	786,700
Indian Lake (FMP)	*107	91	91	65	103,300
New York City Reservoir System (MW)	†84	99	100	70	1,680,000
NEW JERSEY					
Wanaque (M)	98	100	93	94	85,100
PENNSYLVANIA					
Allegheny (FPR)	*53	51	45	42	1,180,000
Pymatuning (FMR)	96	96	101	86	188,000
Raystown Lake (FR)	*68	67	61	68	761,900
Lake Wallenpaupack (PR)	79	70	78	64	157,800
MARYLAND					
Baltimore Municipal System (M)	†78	100	93	76	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	*99	96	92	86	288,800
Narrows (Badin Lake) (P)	98	97	100	97	128,900
High Rock Lake (P)	*95	95	84	74	234,800
SOUTH CAROLINA					
Lake Murray (P)	*92	93	83	91	1,614,000
Lakes Marion and Moultrie (P)	*87	89	81	85	1,777,000
SOUTH CAROLINA-GEORGIA					
Strom Thurmond Lake (FP)	76	83	74	76	1,730,000
GEORGIA					
Burton (PR)	97	97	92	86	104,000
Sinclair (MPR)	90	92	91	89	214,000
Lake Sidney Lanier (FMPR)	65	67	62	66	1,686,000
ALABAMA					
Lake Martin (P)	98	97	95	90	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	63	70	61	57	2,293,000
Douglas Lake (FPR)	*69	74	61	42	1,395,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	81	89	77	65	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	*75	82	66	66	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	73	88	76	63	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	*96	97	73	58	365,000
Wisconsin River (21 Reservoirs) (PR)	*85	90	70	53	399,000
MINNESOTA					
Mississippi River Headwater System (FMR)	36	39	31	30	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	†60	53	79	60	22,700,000
SOUTH DAKOTA					
Angostura (I)	79	48	80	79	130,770
Belle Fourche (I)	†43	44	70	38	185,200
Lake Francis Case (FIP)	†79	77	85	78	4,589,000
Lake Oahe (FIP)	†65	60	74	66	22,240,000
Lake Sharpe (FIP)	101	102	101	102	1,697,000
Lewis and Clark Lake (FIP)	90	82	88	89	432,000
NEBRASKA					
Lake McConaughy (IP)	†61	60	78	60	1,948,000
OKLAHOMA					
Eufaula (FPR)	99	98	97	95	2,378,000
Keystone (FPR)	†82	90	102	83	661,000
Tenkiller Ferry (FPR)	103	105	101	102	628,200
Lake Altus (FIMR)	*98	71	57	92	133,000
Lake O'The Cherokees (FPR)	94	91	92	90	1,492,000
OKLAHOMA-TEXAS					
Lake Texoma (FMPRW)	93	96	94	95	2,722,000
TEXAS					
Bridgeport (IMW)	*96	85	54	96	386,400
Canyon (FMR)	*120	94	82	146	385,600
International Amistad (FIMPW)	*98	63	81	105	3,497,000
International Falcon (FIMPW)	*105	64	68	106	2,668,000
Livingston (IMW)	*99	101	92	99	1,788,000
Possum Kingdom (IMPRW)	92	86	93	93	570,200
Red Bluff (P)	*39	21	27	41	307,000
Toledo Bend (P)	94	101	91	101	4,472,000
Twin Buttes (FIM)	*74	52	36	65	177,800
Lake Kemp (IMW)	*98	86	85	100	268,000
Lake Meredith (FMW)	38	35	36	38	796,900
Lake Travis (FIMPRW)	*99	100	81	103	1,144,000
MONTANA					
Canyon Ferry (FIMPR)	71	70	73	70	2,043,000
Fort Peck (FPR)	†60	55	81	61	18,910,000
Hungry Horse (FIPR)	60	47	56	56	3,451,000
WASHINGTON					
Ross (PR)	*42	20	27	34	1,052,000
Franklin D. Roosevelt Lake (IP)	*64	13	46	78	5,022,000
Lake Chelan (PR)	38	58	39	23	676,100
Lake Cushman (PR)	*95	95	86	82	359,500
Lake Merwin (P)	104	103	100	96	245,600
IDAHO					
Boise River (4 Reservoirs) (FIP)	†38	46	70	37	1,235,000
Coeur d'Alene Lake (P)	†72	91	122	48	238,500
Pend Oreille Lake (FP)	54	52	56	40	1,561,000
IDAHO-WYOMING					
Upper Snake River (8 Reservoirs) (MP)	77	70	73	79	4,401,000
WYOMING					
Boysen (FIP)	*69	75	61	70	802,000
Buffalo Bill (IP)	60	44	60	62	421,300
Keyhole (F)	†15	16	45	15	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	†41	38	55	40	3,056,000
COLORADO					
John Martin (FIR)	†13	12	20	19	364,400
Taylor Park (IR)	*60	65	54	61	106,200
Colorado-Big Thompson Project (I)	54	48	58	53	730,300
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	†61	63	71	60	31,620,000
UTAH-IDAHO					
Bear Lake (IPR)	†36	37	64	35	1,421,000
CALIFORNIA					
Folsom (FIMPR)	68	55	73	59	1,000,000
Hetch Hetchy (MP)	40	20	38	31	360,400
Isabella (FIR)	†19	15	34	15	568,100
Pine Flat (FIR)	†24	22	58	19	1,001,000
Clair Engle Lake (Lewiston) (FP)	†42	45	83	32	2,438,000
Lake Almanor (P)	*80	76	62	75	1,036,000
Lake Berryessa (FIMRW)	†39	47	86	39	1,600,000
Millerton Lake (FI)	*86	73	66	71	503,200
Shasta Lake (FIPR)	†60	50	88	53	4,377,000
CALIFORNIA-NEVADA					
Lake Tahoe (IMPRW)	†0	0	58	0	744,600
NEVADA					
Rye Patch (I)	†10	7	64	8	194,300
ARIZONA-NEVADA					
Lake Mead and Lake Mohave (FIMP)	*77	76	70	78	27,970,000
ARIZONA					
San Carlos (IP)	*75	54	31	75	935,100
Salt and Verde River System (IMPR)	*88	96	57	85	2,019,100
NEW MEXICO					
Conchas (FIR)	*96	56	80	97	315,700
Elephant Butte and Caballo (FIPR)	*101	65	42	80	2,394,000

[1] 1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.

[2] Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

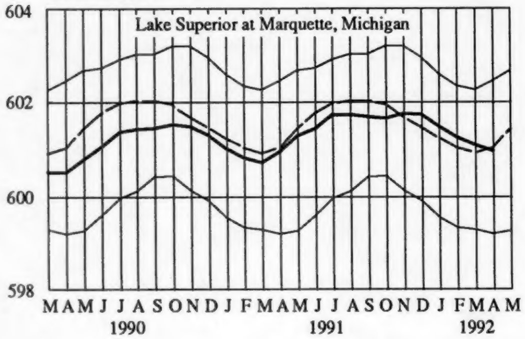
* Above-average range

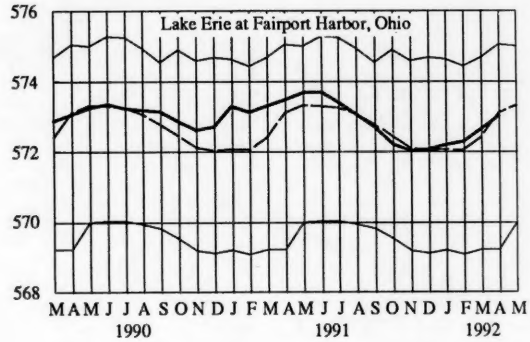
† Below-average range

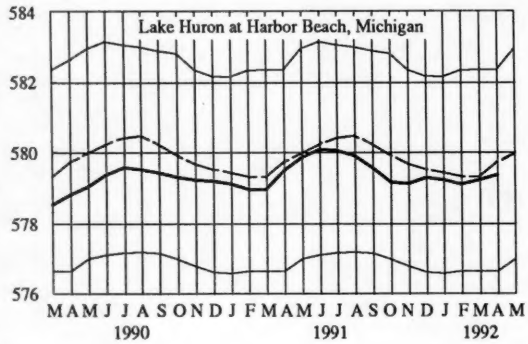
GREAT LAKES ELEVATIONS

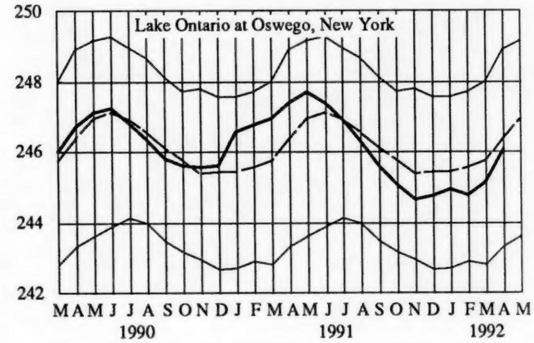
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period. Data from National Ocean Service.

ELEVATION, IN FEET ABOVE NATIONAL GEODETIC VERTICAL DATUM OF 1929

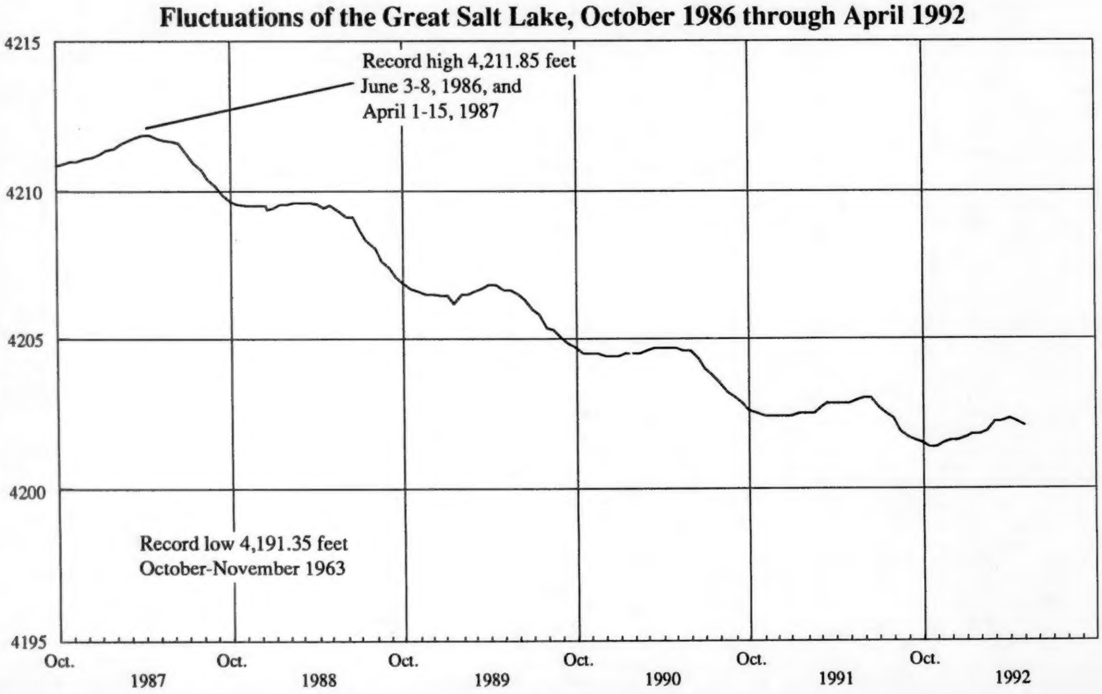




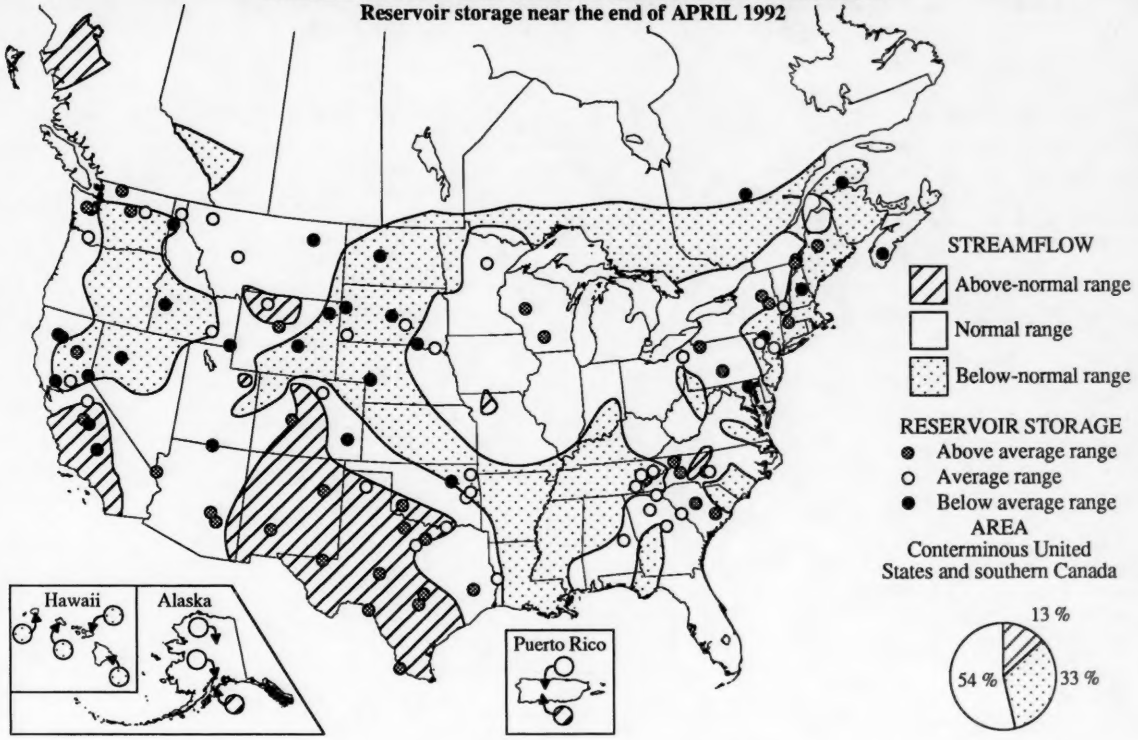




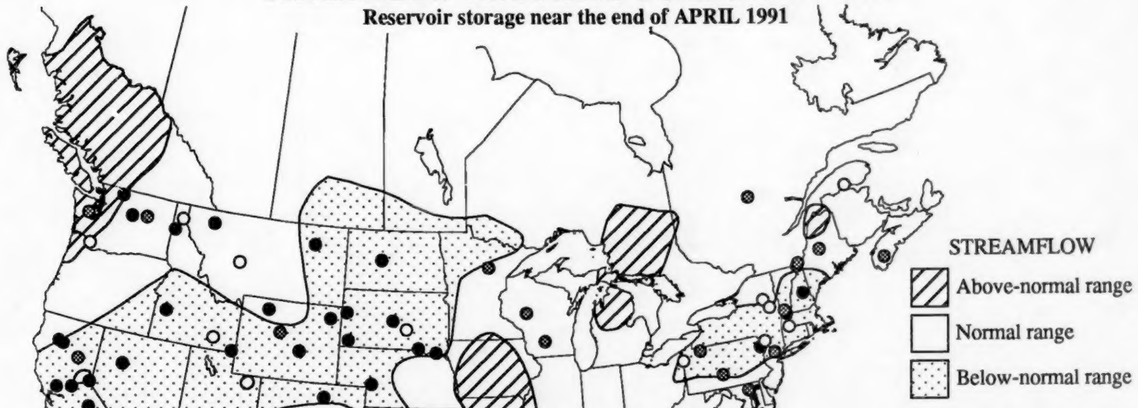
Fluctuations of the Great Salt Lake, October 1986 through April 1992



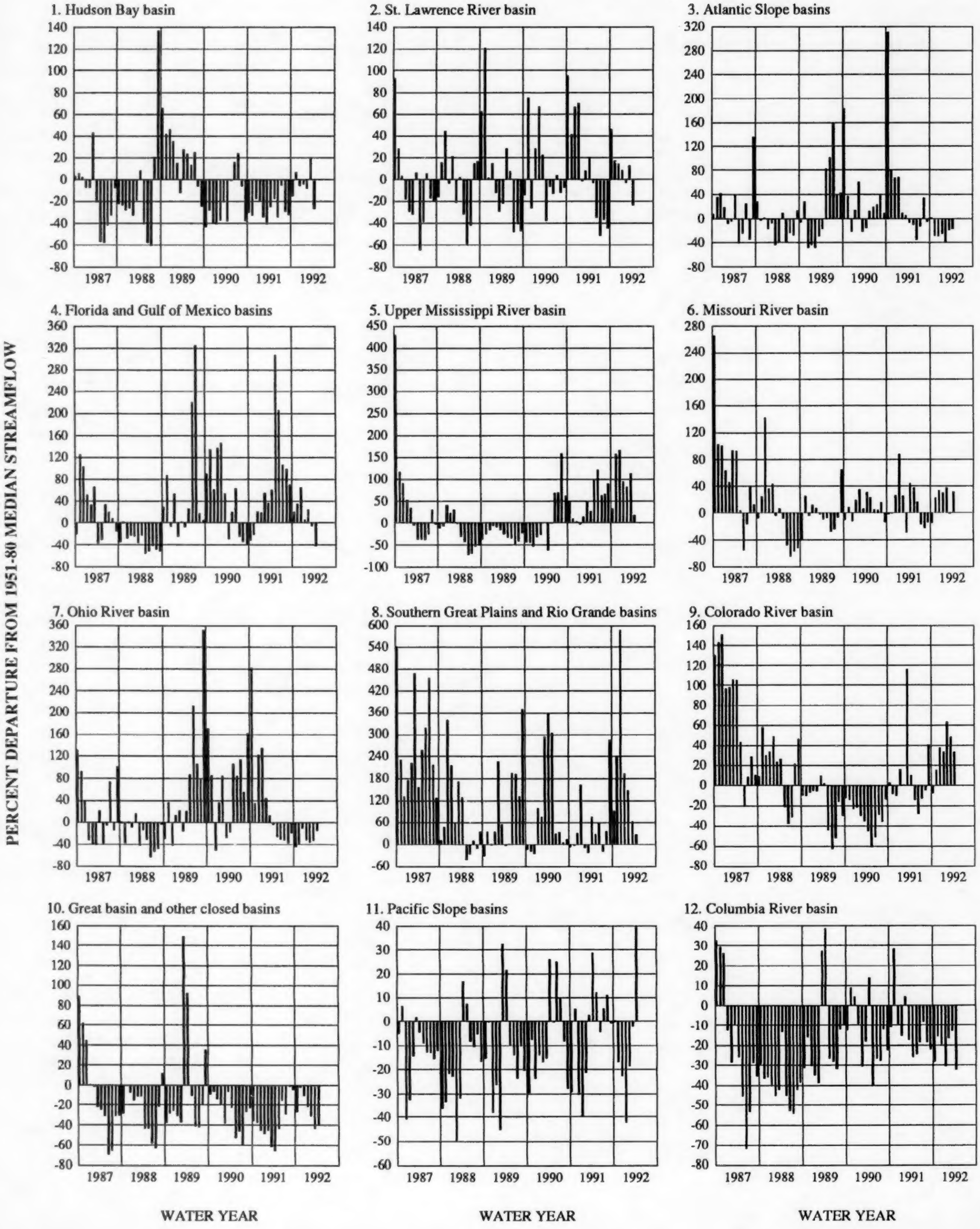
STREAMFLOW CONDITIONS DURING APRIL 1992
Reservoir storage near the end of APRIL 1992



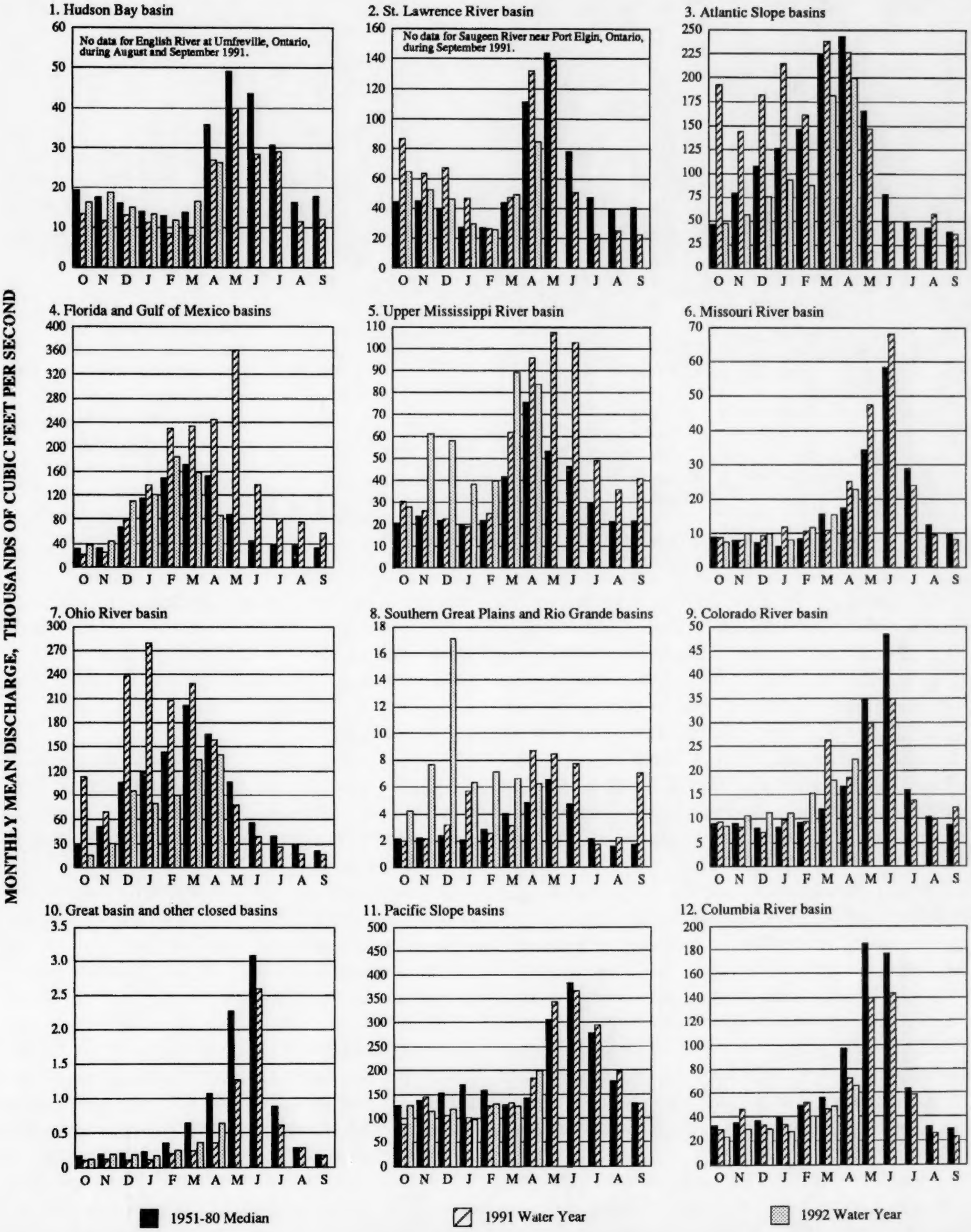
STREAMFLOW CONDITIONS DURING APRIL 1991
Reservoir storage near the end of APRIL 1991



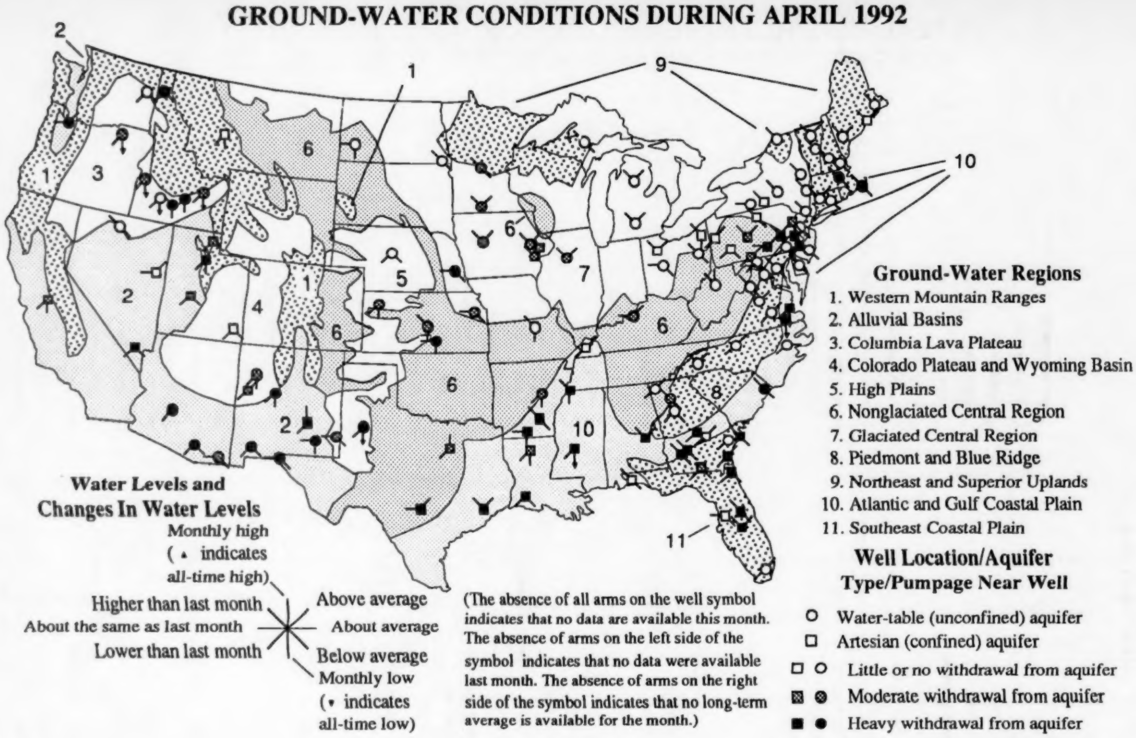
MONTHLY DEPARTURE OF ACTUAL STREAMFLOW (OCTOBER 1986-APRIL 1992) FROM MEDIAN STREAMFLOW (1951-80)



ACTUAL MONTHLY STREAMFLOW, 1991 AND 1992 WATER YEARS, COMPARED WITH MEDIAN MONTHLY STREAMFLOW, 1951-80



GROUND-WATER CONDITIONS DURING APRIL 1992



New extremes occurred at 33 ground-water index stations (see table on page 20) during April—29 lows (including 8 all-time) and 4 highs (including 1 all-time)—compared with 32 new extremes last month. Graphs showing water levels at seven stations—for wells in the Western Mountain Ranges region in Washington, the Alluvial Basins region in Utah, the High Plains region in New Mexico, the Glaciated Central region in Kansas and Ohio, the Piedmont and Blue Ridge region in New Jersey, and the Atlantic and Gulf Coastal Plain region in Alabama—for the past 26 months are on page 21.

Ground-water levels in the Western Mountain Ranges region were below last month's levels and below long-term average throughout the Region. An April low occurred in the well in Montana.

In the Alluvial Basins region, levels were mixed in Nevada and at or below last month's levels elsewhere. Levels were above long-term average in Oregon, mixed in Nevada and New Mexico, and below average elsewhere in the Region. April lows occurred in wells in California, Utah, and New Mexico. An April high occurred in a well in New Mexico.

In the Columbia Lava Plateau region, water levels were below last month's except at one well in Idaho, and below long-term averages throughout the Region. April lows occurred in all index wells in the Region; four of which were all-time lows. All-time lows occurred in the Snake River Plain aquifer wells at Gooding and Atomic City, Idaho; in the shallow alluvium aquifer well near Meridian, Idaho; and in the Columbia River basalts aquifer at Pendleton, Oregon.

Ground-water levels were below last month's levels throughout the Colorado Plateau and Wyoming Basin region. Levels were below long-term average in Utah and mixed with respect to average in New Mexico. An April low occurred in the well in New Mexico.

In the High Plains region, ground-water levels were at or below last month's levels and below long-term average throughout the Region. An April low occurred in the well in Kansas and an all-time low level occurred in the Ogallala aquifer near Lubbock, Texas.

Ground-water levels in the Nonglaciated Central region were generally at or below last month's levels in North Dakota, Texas, Kentucky, Maryland, and Georgia; mixed in Pennsylvania; and generally above last month's levels elsewhere. Water levels were above long-term averages in Texas, Kentucky, West Virginia, and Georgia; mixed in Pennsylvania; and below average elsewhere. April lows occurred in wells in North Dakota, Kansas, and Missouri. April highs occurred in Texas and West Virginia.

Provisional data; subject to revision

WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES–APRIL 1992

GROUND–WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well in feet	Water level in feet below land–surface datum	Departure from average in feet	Net change in water level in feet since: Last month	Last year	Year records began	Remarks
WESTERN MOUNTAIN RANGES (1)								
Rathdrum Prairie aquifer near Athol, northern Idaho	●	485	462.6	–0.9	–0.3	–1.8	1929	
ALLUVIAL BASINS (2)								
Alluvial valley fill aquifer in Steptoe Valley, Nevada	□	122	7.77	3.93	–.02	–.36	1949	
Valley fill aquifer, Elfrida area near Douglas, Arizona	◍	124	101.21	–18.37	.05	–2.09	1947	
Hueco bolson aquifer at El Paso, Texas	●	640	270.40	–18.51	.07	1.24	1964	
COLUMBIA LAVA PLATEAU (3)								
Snake River Plain aquifer near Eden, Idaho	●	208	132.9	–10.3	1.2	–3.3	1962	April low
Columbia River basalt aquifer, Pendleton, Oregon		1,501	224.40	–38.78	–2.88	–4.72	1965	All–time low
COLORADO PLATEAU AND WYOMING BASIN (4)								
Dakota aquifer near Blanding, Utah	□	140	50.62	–3.65	–.27	–2.53	1960	
HIGH PLAINS (5)								
Ogallala aquifer near Colby, Kansas	◍	175	130.93	–12.23	–.55	–.89	1947	April low
Southern High Plains aquifer, Lovington, New Mexico	◍	212	59.01	–5.01	–.01	.77	1971	
NONGLACIATED CENTRAL REGION (6)								
Sentinel Butte aquifer near Dickinson, North Dakota	○	160	21.78	–4.16	.01	–.65	1968	April low
Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	21.00	–3.59	.06	–.59	1937	April low
Glacial outwash sand and gravel aquifer near Louisville, Kentucky	◍	94	18.14	6.10	–.07	–1.23	1945	
Upper Pennsylvanian aquifer in the Central Appalachians Plateau near Glenville, West Virginia	○	25	12.03	4.06	.14	2.30	1953	April high
GLACIATED CENTRAL REGION (7)								
Fluvial sand and gravel aquifer, Platte River Valley, near Ashland, Nebraska	●	12	5.80	–1.92	.01	–.04	1933	
Sheyenne Delta aquifer near Wyndmere, North Dakota	○	40	7.05	–3.56	.27	.67	1963	
Pleistocene (glacial drift) aquifer at Princeton in northern Illinois	◍	29	5.90	1.39	.10	–.10	1942	
Shallow drift aquifer near Roscommon in north–central part of Lower Peninsula, Michigan	○	14	2.83	.98	.92	.45	1934	
Silurian–Devonian carbonate aquifer near Dola, Ohio	□	51	6.37	.21	.78	–.12	1954	
PIEDMONT AND BLUE RIDGE (8)								
Water–table aquifer in Petersburg Granite, southeastern Piedmont, Colonial Heights, Virginia	○	100	14.28	.22	–.42	–.63	1939	
Weathered granite aquifer, western Piedmont, Mocksville area, North Carolina	○	31	15.70	1.01	–.21	–2.45	1981	
Surficial aquifer at Griffin, Georgia	○	30	15.13	–2.00	–.26	.31	1943	
NORTHEAST AND SUPERIOR UPLANDS (9)								
Pleistocene glacial outwash aquifer, at Camp Ripley, near Little Falls, Minnesota	◍	59	15.16	–2.33	.29	.36	1949	
Glacial outwash sand aquifer at Oxford, Maine	○	39	7.42	.20	.16	.25	1980	
Shallow sand aquifer (glacial deposits), Acton, Massachusetts	●	34	18.37	–.61	.33	–.40	1965	
Pleistocene sand aquifer near Morrisville, Vermont	○	50	16.59	.76	2.38	.84	1966	
ATLANTIC AND GULF COASTAL PLAIN (10)								
Columbia deposits aquifer near Camden, Delaware	○	11	7.64	–1.95	.52	–1.09	1950	
Memphis sand aquifer near Memphis, Tennessee	■	384	106.39	–15.68	–.19	–.32	1940	April low
Eutaw aquifer in the City of Montgomery, Alabama	■	270	16.0	3.6	2.8	8.5	1952	
Evangeline aquifer at Houston, Texas	■	1,152	282.94	13.72	4.80	20.57	1978	
SOUTHEAST COASTAL PLAIN (11)								
Upper Floridan aquifer on Cockspur Island, Savannah area, Georgia	■	348	33.13	–6.04	.33	2.97	1956	
Upper Floridan aquifer, Jacksonville, Florida	■	905	–22.8	–5.7	–.6	.8	1930	
Biscayne aquifer near Homestead, Florida	○	20	7.15	–.81	–.26	.90	1932	

Ground-water levels in the Glaciated Central region were at or above last month's except in Iowa where they were mixed and Pennsylvania where they were below last months levels. Levels were above long-term averages in Minnesota, Illinois, and Michigan; mixed in Iowa, Ohio, and Pennsylvania; and below average in North Dakota, Nebraska, and Kansas. April lows occurred in wells in Iowa and Ohio. An all-time high level occurred in the Devonian aquifer well near Morse, Iowa.

In the Piedmont and Blue Ridge region, ground-water levels were below last month's in Pennsylvania and New Jersey, above last month's in Maryland, and mixed elsewhere in the Region. Levels were below long-term averages in New Jersey, Maryland, and Georgia; at or above long-term averages in Virginia and North Carolina; and mixed in Pennsylvania.

Provisional data; subject to revision

NEW EXTREMES DURING APRIL AT GROUND–WATER INDEX STATIONS

WRD Station Identification Number	GROUND–WATER REGION Aquifer and Location	Aquifer type and local aquifer pumpage	Depth of well	Years of record	End–of–month water level in feet below land surface datum: Previous April Record: Average	Extreme (year)	April 1992
	LOW WATER LEVELS						
	WESTERN MOUNTAIN RANGES						
463906112043901	Cretaceous aquifer near Helena, Montana	□	110	16	29.61	35.86 (1991)	37.58
	ALLUVIAL BASINS						
324340104231701	Roswell Basin shallow aquifer at Dayton, New Mexico	●	250	40	92.22	122.86 (1991)	123.17
351051106395301	Basin-fill aquifer at Albuquerque, New Mexico	●	980	8	32.27	36.40 (1991)	37.14
382444121123301	Mehrten aquifer near Wilton, California	▩	300	5	131.54	134.99 (1991)	136.67
403803111505301	Basin-fill aquifer near Holladay, Utah	■	165	13	62.97	78.75 (1991)	81.72
	COLUMBIA LAVA PLATEAU						
423659114111601	Snake River Plain aquifer near Eden, Idaho	●	208	30	122.6	129.9 (1982)	132.9
424953113412801	Snake River Plain aquifer near Rupert, Idaho	●	194	41	151.2	159.6 (1991)	163.0
425635114382302	Snake River Plain aquifer at Gooding, Idaho	○	165	19	139.4	149.6 (1962)	[1]149.9
432700112470801	Snake River Plain aquifer near Atomic City, Idaho	◍	636	42	585.0	587.5 (1980)	[1]588.3
433852116244801	Shallow alluvium aquifer near Meridian, Idaho	◍	32	56	10.4	11.7 (1962)	[1]13.8
453934118491701	Columbia River basalts aquifer at Pendleton, Oregon	◍	1,501	22	185.62	219.68 (1991)	[1]224.40
	COLORADO PLATEAU AND WYOMING BASIN						
352023107473201	Westwater Canyon aquifer near Grants-Bluewater, New Mexico	◍	155	36	76.12	79.85 (1991)	81.29
	HIGH PLAINS						
341010102240801	Ogallala aquifer near Lubbock, Texas	●	202	41	57.84	91.58 (1991)	[1]93.67
392329101040201	Ogallala aquifer near Colby, Kansas	◍	175	45	118.70	130.04 (1991)	130.93
	NONGLACIATED CENTRAL REGION						
375039097234201	Sand and gravel Pleistocene aquifer near Valley Center, Kansas	●	54	54	17.41	20.41 (1991)	21.00
375749091475001	Ozark aquifer near Rolla, Missouri	○	450	4	347.80	349.69 (1989)	351.44
375810097324301	Equus aquifer near Halstead, Kansas	◍	57	52	22.62	35.07 (1991)	39.17
465755102410701	Sentinel Butte aquifer near Dickinson, North Dakota	○	160	23	17.62	21.13 (1991)	21.78
	GLACIATED CENTRAL REGION						
411401081025000	Pennsylvanian sandstone aquifer near Windham, Ohio	□	55	45	19.05	21.39 (1954)	22.71
415534091251502	Cambrian Ordovician aquifer at Mt. Vernon, Iowa	▩	1,557	4	335.78	338.67 (1991)	341.35
	NORTHEAST AND SUPERIOR UPLANDS						
430235071275501	Bedrock aquifer near Hookset, New Hampshire	○	103	27	45.17	48.26 (1991)	48.28
445227067520101	Glacial sand and gravel aquifer at Hadley Lakes, Maine	○	30	6	3.59	4.03 (1988)	4.62
	ATLANTIC AND GULF COASTAL PLAIN						
321945090152201	Sparta aquifer system at Jackson, Mississippi	■	852	47	253.55	307.09 (1991)	[1]313.01
322357092341701	Sparta aquifer near Ruston, Louisiana	◍	703	17	223.33	236.24 (1991)	237.42
331438092411901	Sparta aquifer near El Dorado, Arkansas	■	540	36	326.48	348.07 (1991)	370.21
344607091543401	Mississippi Valley alluvial aquifer near Lonoke, Arkansas	●	135	16	108.56	118.11 (1991)	121.70
350900089482300	Memphis sand aquifer near Memphis, Tennessee	■	384	52	90.71	106.30 (1989)	106.39
364059076544901	Middle Potomac aquifer at Franklin, Virginia	●	305	31	169.78	207.63 (1991)	[1]213.61
372506076511703	Upper Potomac aquifer near Toano, Virginia	■	401	7	158.94	162.05 (1991)	[1]163.73
	HIGH WATER LEVELS						
	ALLUVIAL BASINS						
332615104303601	Roswell Basin artesian aquifer at Roswell, New Mexico	■	324	25	59.88	44.46 (1990)	38.70
	NONGLACIATED CENTRAL REGION						
324842097102901	Twin Mountains (Trinity) aquifer near Hurst/Fort Worth, Texas	◍	667	13	456.51	442.11 (1991)	440.45
385604080495901	Upper Pennsylvanian aquifer near Glenville, West Virginia	○	25	38	16.09	13.58 (1990)	12.03
	GLACIATED CENTRAL REGION						
414315091252002	Devonian aquifer near Morse, Iowa	▩	82	50	14.93	8.15 (1952)	[2]6.08

[1] All–time month–end low.

[2] All–time month–end high.

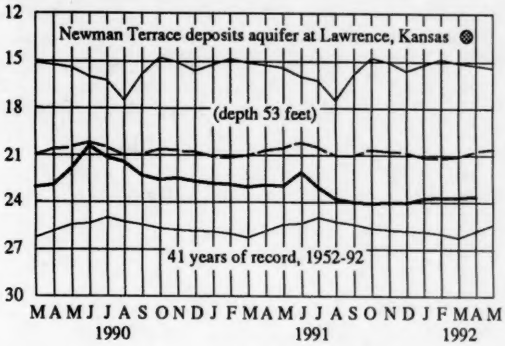
In the Northeast and Superior Uplands region, ground-water levels were above last month's levels except at one well in Maine where an April low occurred. Water levels were mixed with respect to average in Maine, Vermont, and Connecticut; and below average elsewhere.

In the Atlantic and Gulf Coastal Plain region, water levels were at or below last month's in Virginia, Mississippi, Tennessee, Kentucky, and Louisiana; mixed in New Jersey and Arkansas; and above last month's levels elsewhere. Ground-water levels were above long-term averages in Alabama, Kentucky, and Texas; and at or below average elsewhere. April lows occurred in wells in Virginia, Mississippi, Tennessee, Arkansas, and Louisiana. All-time lows occurred in wells in the Middle Potomac aquifer at Franklin and the Upper Potomac aquifer near Toano, Virginia, and in the Sparta aquifer system well at Jackson, Mississippi.

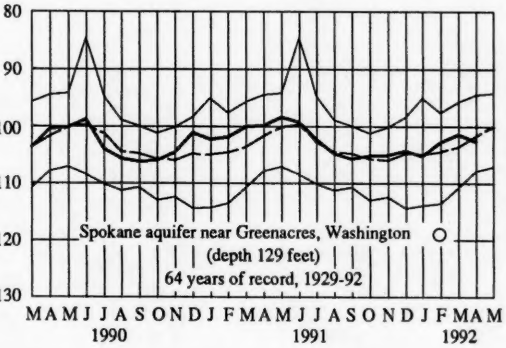
In the Southeast Coastal Plain region, water levels were mixed with respect to last month's levels and mixed with respect to long-term average throughout the Region.

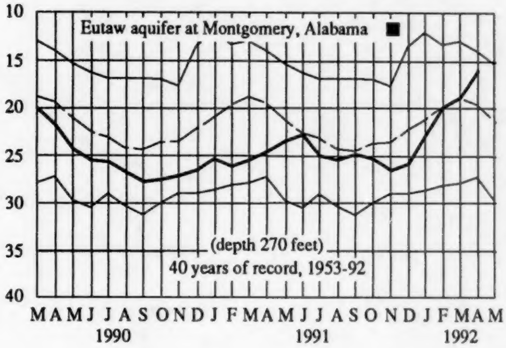
MONTHEND GROUND-WATER LEVELS IN SELECTED WELLS

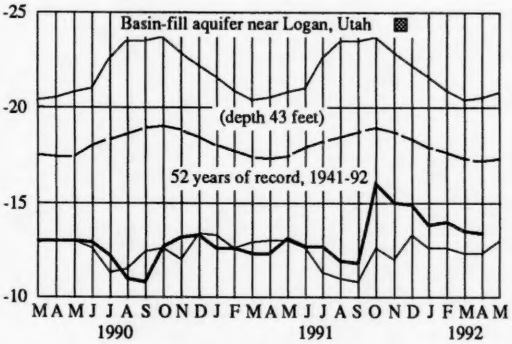
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.

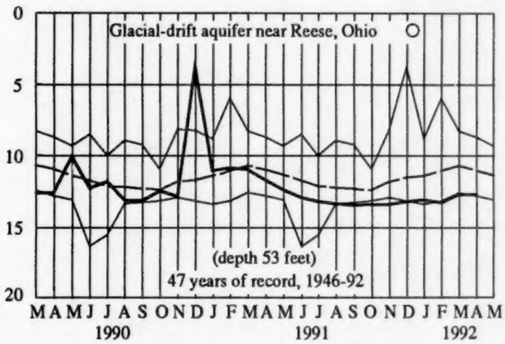


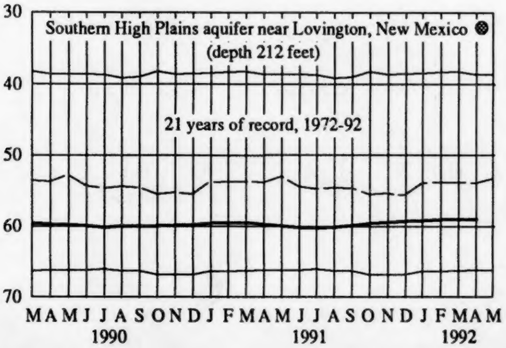
WATER LEVEL, FEET BELOW LAND-SURFACE DATUM

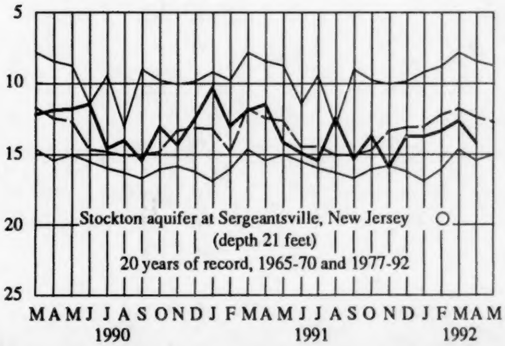












BUREAU OF RECLAMATION RESERVOIR STORAGE IN SELECTED RIVER BASINS APRIL 30, 1992

River basin number	Basin	Storage, in 1,000 acre-feet	Percent of average
1	South Fork Flathead	1,628	102
2	Yakima	930	116
3	Columbia	4,177	224
4	Upper Snake	3,147	100
5	Boise	410	52
6	Payette	548	113
7	Owyhee	158	24
8	Malheur	64	28
9	Umatilla	55	3
10	Deschutes	308	63
11	Rogue	65	52
12	Tualatin	54	104
13	Sacramento	2,669	77
14	Trinity	1,066	58
15	Feather	2,020	74
16	American	697	96
17	San Joaquin	447	137
18	Stanislaus	363	27
19	Lower Colorado	22,286	79
21	Lower Rio Grande	2,372	90
22	Upper Missouri	2,301	102
23	Bighorn	1,750	111
24	North Platte	1,250	73
25	Cheyenne	291	73
26	South Platte	[1]550	94
27	Arkansas	[2]400	94
28	Upper Green	[3]3,338	[4]89
29	Gunnison	[5]555	[4]67
30	San Juan	[6]1,615	[4]95
36	Upper Colorado	[7]13,913	[4]56
37	Klamath	474	55
38	Humboldt	21	21

BUREAU OF RECLAMATION RESERVOIR STORAGE IN SELECTED RIVER BASINS APRIL 30, 1992—continued

River basin number	Basin	Storage, in 1,000 acre-feet	Percent of average
39	Truckee (excluding Lake Tahoe)	102	57
40	Carson	75	38
41	Santa Ynez	177	126
42	Ventura	201	95
43	Republican	427	71
44	Solomon	203	73
45	Niobrara	93	103
46	Lower Platte	180	110
47	Washita	252	132

[1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day. The percent of average storage refers to the average storage on that date over a historic period of record which varies by reservoir.]

[1]Includes Colorado River storage water for the Colorado Big-Thompson Project.
[2]Includes Fryingpan-Arkansas Project storage water.
[3]Flaming Gorge Dam storage water.
[4]Percent of storage capacity rather than percent of average.
[5]Blue Mesa Dam storage water.
[6]Navajo Reservoir storage water.
[7]Lake Powell storage only.

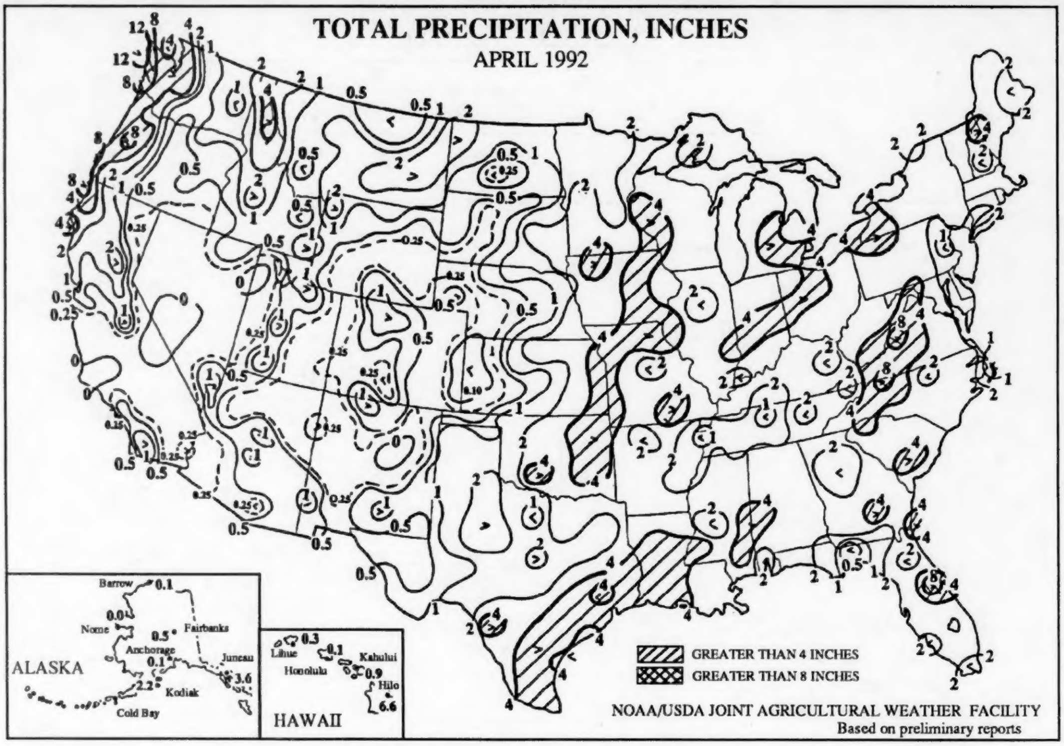
BUREAU OF RECLAMATION RIVER BASIN LOCATION

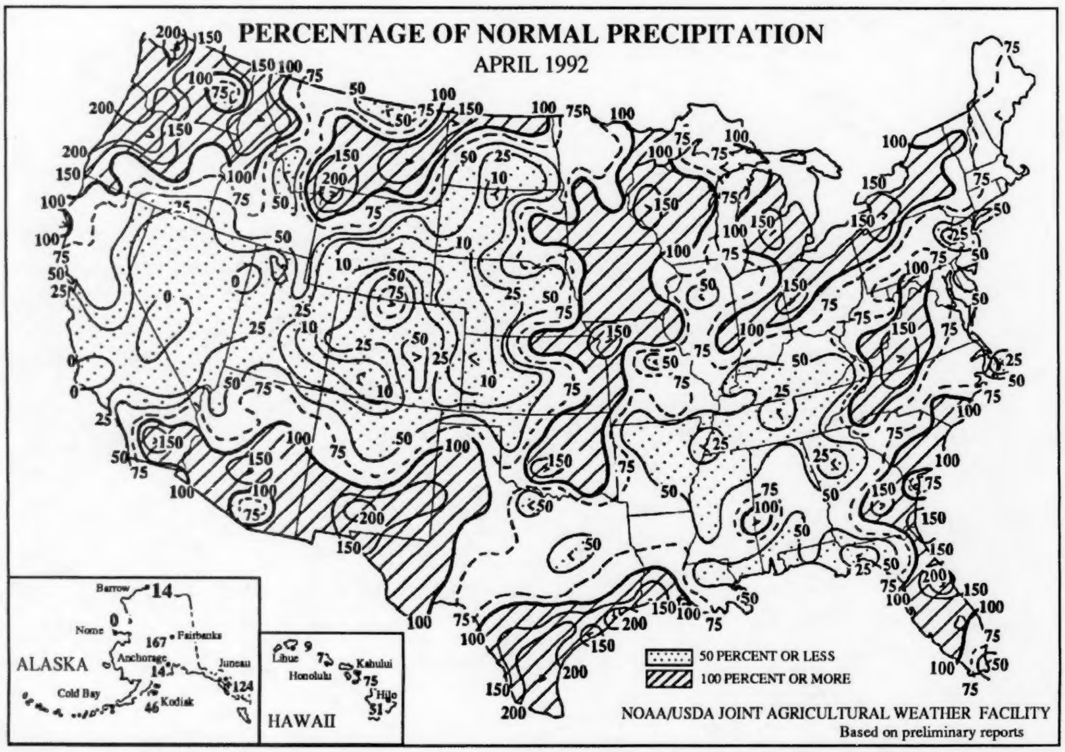
KEY

1 (bold numbers) Basins for which data are given in table

20 (italicized numbers) Basins not reported

Absence of a number in a basin indicates not applicable to Bureau of Reclamation facilities





(From *Weekly Weather and Crop Bulletin*, NOAA/USDA Joint Agricultural Weather Facility)

UNITED STATES APRIL CLIMATE IN HISTORICAL PERSPECTIVE

Preliminary data for April 1992 indicate that temperature averaged across the contiguous United States was much above the long-term mean, ranking April as the 20th warmest on record (the record begins in 1895). For April 1992, at least 173 new record high temperatures were set, mainly in the western half of the country while at least 177 new record lows were set of which most were concentrated in the eastern third of the country.

Areally-averaged precipitation for the Nation was below normal for April (first graph below on left), ranking April 1992 as the 12th driest on record. The preliminary value for precipitation is estimated to be accurate to within 0.15 inche and the confidence interval is plotted in the graph as a '+'. Only 2.8 percent of the country experienced much wetter than normal conditions and 24.8 percent was much drier than normal.

Historical precipitation is shown in a different way in the second graph below on the left. The April precipitation for each climate division in the contiguous U.S. was first standardized using the gamma distribution over the 1951-80 period. These gamma-standardized values were then weighted by area and averaged to determine a National standardized precipitation value. Negative values are dry, positive are wetter than the mean. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The areally-weighted mean standardized National precipitation ranked 1992 as the 7th driest April on record.

The temperature and precipitation rankings for April 1992 for the nine climatically homogeneous regions in the United States show that it was a rather warm and dry month for the country as a whole. Except for the Southeast and East North Central regions, which each had their 27th coolest April, temperatures were in the mid and upper thirds of the historical distribution for warmth. April 1992 was the third warmest April in the 98-year record for the West region as well as the Southwest and ninth warmest for the Northwest region. Precipitation rankings varied considerably. The Southwest region had the sixth driest April on record while, at the other extreme, the Northwest region recorded the twelfth wettest April and was the only region in the upper third of the historical distribution. The East North Central region was in the middle third of the historical distribution with a ranking of 33rd wettest while the remainder of the country was in the dry third of the historical distribution for precipitation. Utah experienced the warmest April on record while six other States ranked in the top ten warmest category.

For the year thus far, the Nation as a whole continued unusually warm, with January-April 1992 ranking as the second warmest such period on record. Over one half (53 percent) of the country has been very warm when compared to the normal while none of the country averaged very cold thus far this year. Four States (Montana, Oklahoma, South Dakota, and Wyoming) recorded the warmest such period on record while Idaho, Nebraska, North Dakota, Oregon, and Washington had the second warmest January-April on record. Kansas and Nevada had the third warmest April on record.

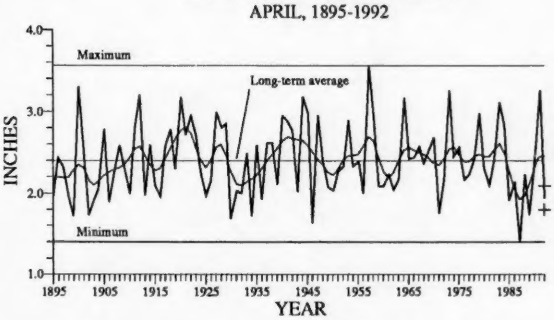
For the Nation, the year thus far shows areally-averaged precipitation near normal. (First graph on right below.) When the local normal climate is taken into account, the year to date ranks as the 37th driest such period on record. (Second graph on right below.)

Long-term drought conditions continued to increase on a National scale with April marking the fifth consecutive month of such increases. The percent area of the contiguous U.S. experiencing long-term drought (as defined by the Palmer Drought Index) rose to about 16 percent. At the same time, the percent area experiencing long-term wet conditions dropped slightly to around 17 percent.

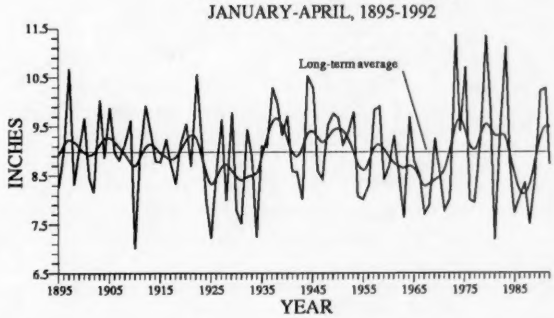
Over 16 percent of the Nation suffered from below normal precipitation for the January-April period while only 10 percent experienced much above normal precipitation. Wyoming had the driest January through April period on record while New Jersey had the second driest such period. Delaware ranked third driest since records started in 1895. Five other States had their 10th driest or drier January-April period on record. Two States (Arizona and Texas) ranked in the top ten wettest category.

Six river basins were in the top third wettest of the historical distribution for the hydrologic year, now 7 months old. Topping the list was the Texas Gulf Coast Basin which had the wettest October-April period on record. The Rio Grande Basin had the eighth wettest such period and the Great Lakes Basin had the ninth wettest such period on record. On the other hand, the driest was the Pacific Northwest Basin with the 11th driest hydrologic year to date while five other river basins were in the lower third of the historical distribution. The California river basin had the 35th driest October-April period on record in 1992.

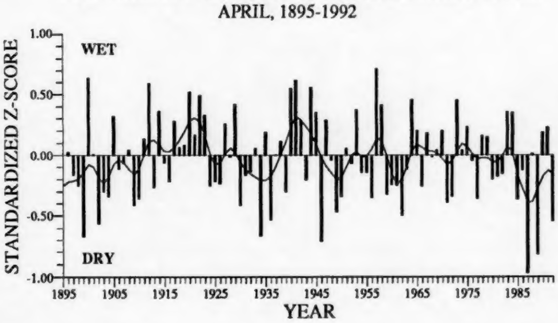
U.S. NATIONAL PRECIPITATION
APRIL, 1895-1992



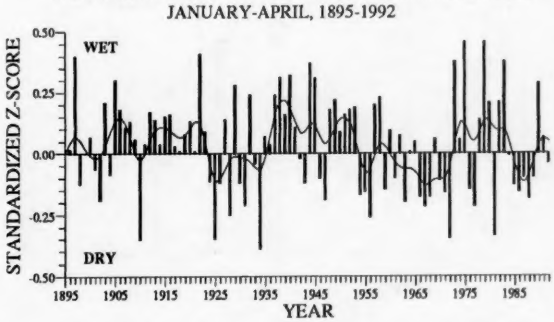
U.S. NATIONAL PRECIPITATION
JANUARY-APRIL, 1895-1992



U.S. NATIONAL WEIGHTED MEAN PRECIPITATION INDEX
APRIL, 1895-1992

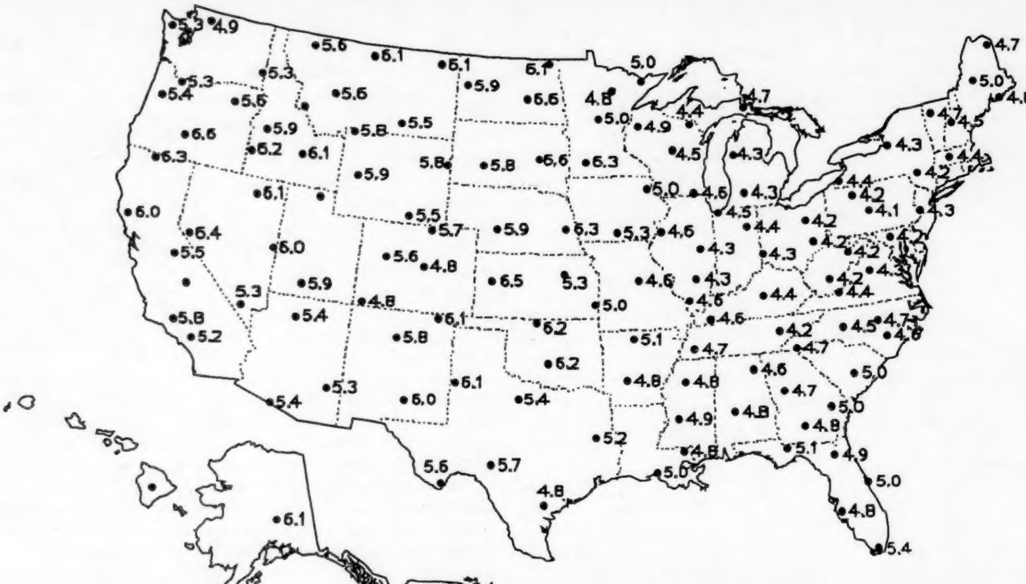


U.S. NATIONAL WEIGHTED MEAN PRECIPITATION INDEX
JANUARY-APRIL, 1895-1992



(From *Climate Variations Bulletin*, National Climatic Data Center, NOAA)

pH of Precipitation for March 23-April 26, 1992

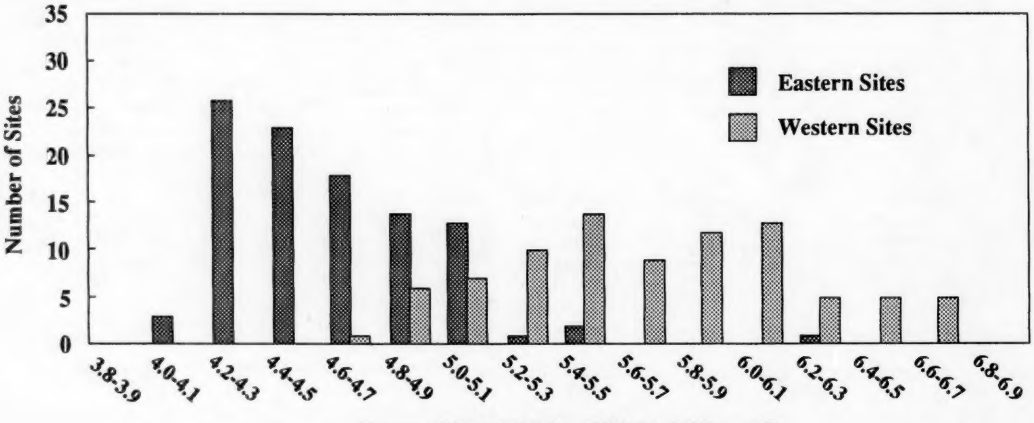


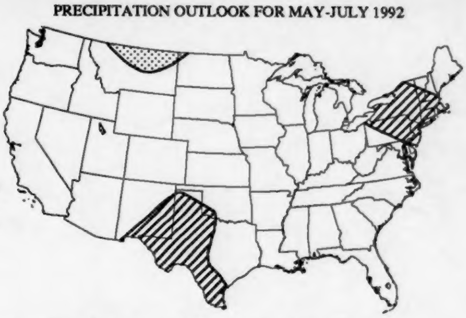
Provisional NADP/NTN data; subject to revision

Current pH data shown on the map (• 4.9) are precipitation-weighted means calculated from preliminary laboratory results provided by the NADP/NTN Central Analytical Laboratory at the Illinois State Water Survey and are subject to change. The 128 points (•) shown on this map represent a subset of all sites chosen to provide relatively even geographic spacing. Absence of a pH value at a site indicates either that there was no precipitation or that data for the site did not meet preliminary screening criteria for this provisional report.

A list of the approximately 200 sites comprising the total Network and additional data for the sites are available from the NADP/NTN Coordination Office, Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO 80523.

Distribution of precipitation-weighted mean pH for all NADP/NTN sites having one or more weekly samples for March 23-April 26, 1992. The East/West dividing line is at the western borders of Minnesota, Iowa, Missouri, Arkansas, and Louisiana.





From *Monthly and Seasonal Weather Outlook* prepared and published by the National Weather Service

NATIONAL WATER CONDITIONS

APRIL 1992

Based on reports from the Canadian and U.S. Field offices; completed June 3, 1992

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The National Water Conditions is published monthly. Subscriptions are free on application to the U.S. Geological Survey, 419 National Center, Reston, VA 22092.

EXPLANATION OF DATA (Revised December 1990)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, and the Puerto Rico index stations because of the limited records available.

The ***streamflow ranges map*** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three ***pie charts*** show: the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The ***combination bar/line graph*** shows the percent departure of the total mean from the total median flow (1951-80) and the cumulative departure from median (in cfs) for all reporting stations (excluding eight large river stations indicated by # in the ***Flow of large rivers*** table) in the conterminous United States and southern Canada.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the ***above-normal range*** if it is greater than the upper quartile, in the ***normal range*** if it is between the upper and lower quartiles, and in the ***below-normal range*** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as ***seasonal*** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as ***contraseasonal*** (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. ***Probability of occurrence*** is the chance that a given flood magnitude will be exceeded in any one year. ***Recurrence interval*** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. ***Recurrence intervals imply no regularity of occurrence***; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about ***ground-water levels*** refer to conditions near the end of the month. The water level in each observation well is compared with average level for the end of the month determined from the entire period of record for that well. ***Changes in ground-water levels***, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). ***Dissolved solids*** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. ***Dissolved-solids discharge*** represents the total daily amount of dissolved minerals carried by the stream. ***Dissolved-solids concentrations*** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

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